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16. ABSTRACT

Iowa's air monitoring data from 1957 to 1977 has been compiled in this report for six pollutants monitored in the State: suspended particulates, sulfur dioxide, nitrogen dioxide, carbon monoxide, hydrocarbons and photochemical oxidants. The data are presented in tabular form for each of the twelve Air Quality Control Regions in the State. To help the reader better understand the large amount of technical information in this report, additional sections discussing the pollutants and pollutant sources, the air monitoring network, and the analysis of data and trends have been added. A summary of suspended particulate levels from winter storms in Iowa is included.

17. KEY WORDS AND DOCUMENT ANALYSIS

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IOWA AIR QUALITY REPORT

1977

APRIL 1978

PREPARED BY:

AIR AND LAND QUALITY DIVISION

IOWA DEPARTMENT OF ENVIRONMENTAL QUALITY

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PREFACE

The 1977 Iowa Air Quality Report was developed by the staff of the Air and Land Quality Division of the Iowa Department of Environmental Quality to inform the public of Iowa's air quality for the previous year. This manual contains a summary of air monitoring data collected in Iowa from 1957 to 1977 and more detailed analysis of data collected during 1977. Also included are summaries of special air monitoring-related projects being conducted by the Department.

The intent of this report is to supply information regarding Iowa's air quality to Iowans with a wide range of technical backgrounds and interests. Technical terminology is used in some places to provide those with an interest in air pollution chemistry the opportunity to have precise information available. Readers who have no interest in this area should find the report quite informative and less confusing by skipping over the sections which are technically complex.

The report is based upon analyses performed by the State Hygienic Laboratory, University of Iowa, Iowa City; by the Air Pollution Division of the Des Moines-Polk County Health Department; by the Air Pollution Division of the Linn County Health Department; and by the Environmental Protection Agency's National Air Surveillance Network. Monitor operation and maintenance for Scott County was conducted by the Quad Cities Regional Air Pollution Control Board, Rock Island, Illinois and the Scott County Health Department, Davenport, Iowa. Special recognition should also be given to the many local monitoring equipment operators who, in a large part, volunteer their services.

We hope that this report will be both a source of information and a guide for further air quality improvement in Iowa.

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I. AMBIENT AIR QUALITY STANDARDS

The National Ambient Air Quality Standards (NAAQS) were established by the U.S. Environmental Protection Agency in 1971, as required by the Clean Air Act of 1970. These standards were developed for six pollutants: suspended particulates, sulfur dioxide, carbon monoxide, nitrogen dioxide, hydrocarbons, and photochemical oxidants. Each standard specifies a concentration and an exposure time which were developed from research on the physiological effects of various pollutant levels.

The NAAQS for the six pollutants are separated into two categories, primary and secondary. Primary ambient air quality standards define levels of air quality which are necessary to protect the public health from adverse effects of a pollutant. Secondary ambient air quality standards, which are generally more restrictive than primary, define levels of air quality which are necessary to protect the public welfare from adverse effects of a pollutant. For some pollutants, the primary and secondary standards are identical. Neither the primary nor secondary air quality standards, excluding annual means, are to be exceeded more than once per year. The annual means should never be exceeded. Table 1 lists the NAAQS for the six pollutants listed above.

The national standards provide a guide on air quality throughout Iowa. In areas where the monitored values are below the secondary standards, the air is considered to be of a good quality that will cause no harm. If the monitored values are above the secondary but below the primary, the air is considered to be of a moderate quality that may deteriorate the environmental surroundings.

Monitored levels above the primary standard may be hazardous to some people and are considered to be of a poor quality. Comparing monitored levels of a pollutant with the NAAQS is a simple method of estimating the air quality in any area of Iowa.

TABLE 1

National Primary and Secondary
Ambient Air Quality Standards

Concentrations shown are specified in the following units:

ug/m^3 - micrograms per cubic meter
mg/m^3 - milligrams per cubic meter
ppm - parts per million

All Values Except Annual Means Are Not To Be Exceeded More Than Once Per Year.

PARTICULATE	Maximum 24-Hour Average	Annual Geometric Mean
Primary	260 ug/m^3	75 ug/m^3
Secondary	150 ug/m^3	60 ug/m^3

SULFUR DIOXIDE	Maximum 3-Hour Average	Maximum 24-Hour Average	Annual Arithmetic Mean
Primary	No Standard	365 ug/m^3 (0.14ppm)	80 ug/m^3 (0.03 ppm)
Secondary	1300 ug/m^3 (0.5 ppm)	No Standard	No Standard

CARBON MONOXIDE	Maximum 1-Hour Average	Maximum 8-Hour Average
Primary	40 mg/m^3 (35 ppm)	10 mg/m^3 (9 ppm)
Secondary	40 mg/m^3 (35 ppm)	10 mg/m^3 (9 ppm)

PHOTOCHEMICAL OXIDANTS	Maximum 1-Hour Average
Primary	160 ug/m^3 (0.08 ppm)
Secondary	160 ug/m^3 (0.08 ppm)

NITROGEN DIOXIDE	Annual Arithmetic Mean
Primary	100 ug/m^3 (0.05 ppm)
Secondary	100 ug/m^3 (0.05 ppm)

HYDROCARBONS	Maximum 3-Hour Average 6 to 9 A.M.
Primary	160 ug/m^3 (0.24 ppm)
Secondary	160 ug/m^3 (0.24 ppm)

II. HISTORICAL DEVELOPMENT OF AIR QUALITY MONITORING IN IOWA

The first monitoring of air pollution in Iowa originated in 1957, when the federal government established a National Air Surveillance Network (NASN) site in Des Moines. The site originally monitored only suspended particulates but later added a gas bubbler monitor at this same location to monitor sulfur dioxide and nitrogen dioxide. Additional cities in Iowa were later added to the NASN and monitored for suspended particulates, sulfur dioxide and nitrogen dioxide. The cities included in this network at one time or another were Davenport, Dubuque, Waterloo, Cedar Rapids, and Des Moines. On January 1, 1978, the NASN sites were incorporated into the state network ending a twenty-one year period of NASN monitoring in Iowa.

In 1967 the Iowa legislature created the Iowa Air Pollution Control Commission, directing the Commission to develop and carry out a pollution control program. Staff support for the Commission was provided by the Environmental Engineering Division of the State Health Department.

The legislature also designated the State Hygienic Laboratory as the state air pollution testing facility and provided a separate appropriation to begin air monitoring at the state level. Initial efforts consisted of equipping and staffing an air monitoring mobile laboratory to be used in conducting short term air quality surveys of suspended particulates and sulfur dioxide parameters, and in gathering wind speed and direction information.

After extensive mobile monitoring system design and equipment modification by the State Hygienic Laboratory staff, the mobile laboratory performed its first air monitoring surveys in Des Moines and Sioux City in October 1968. Multiple surveys in some 14 Iowa cities were performed during the time period 1969 through 1972.

In late 1968 the State Hygienic Laboratory, after consultation with the Iowa State Health Department, submitted a "Plan For State Wide Air Monitoring" to the Air Pollution Control Commission. This plan established an extensive statewide network consisting of some 650 dustfall collection stations and 12 suspended particulate high volume (hi vol) air samplers as well as sufficient funds to make extensive use of the mobile monitoring laboratory. This plan was funded on a contract basis to the State Hygienic Laboratory for fiscal year 1970 through a consolidated legislative appropriation to the Health Department in the Spring of 1969.

Two counties in Iowa developed a local air pollution control agency in 1969 and 1970. Both Polk and Linn Counties developed a city and county network in their areas. Linn County acquired a mobile monitoring capability for suspended particulate, continuous sulfur dioxide and wind speed and direction parameters. In 1973 continuous ozone instrumentation was added to the mobile trailer and a fixed station sulfur dioxide monitor was put into operation. The Des Moines-Polk County local program began operation of a suspended particulate (Hi Vol) sampling network in 1969 and enlarged it in 1972. In 1973 the local agency in Polk County began extensive monitoring of gaseous pollutants via a bubbler network for sulfur dioxide and nitrogen dioxide and a fixed station continuous instrumentation for ozone and carbon monoxide.

The issuance of air pollution control plan implementation guidelines and pollutant criteria documents by the Environmental Protection Agency caused the Air Pollution Control Commission to redirect its air monitoring efforts in mid 1971. The Commission reduced the number of dustfall stations to 350 and requested the Health Department and the Hygienic Laboratory to present a new monitoring program plan that would adequately consider these new guidelines.

In late 1971 the State Hygienic Laboratory's version was presented to the Commission. In early 1972 a compromise between the Health Department and State Hygienic Laboratory plans was accepted by the Commission. This plan provided for updating of the mobile laboratory capabilities and expanding of the fixed station network. Continuous ozone and hydrocarbon monitoring equipment was added to the mobile laboratory. Additional hi vols and tape samplers were added to the fixed station network to increase the available information about suspended particulate levels. Gas samplers to monitor sulfur dioxide and nitrogen dioxide levels were also added to the fixed station network.

Again in 1973, upon recommendation from the newly organized Department of Environmental Quality (DEQ), the fixed station network operated by the State Hygienic Laboratory was revised and complemented with continuous sulfur dioxide monitors, more hi vols and gas bubblers and the initiation of an adequate backup capability for all network instrumentation. Most of the original 650 dustfall collection stations were also eliminated because of the diminishing need for this information.

In 1975 an extensive evaluation of the state and local air monitoring networks was conducted. This investigation prompted numerous changes and relocations of monitoring sites and equipment in the statewide network. During 1975 and 1976, a total of 42 monitors were installed, moved, or adjusted in some way as part of DEQ's quality assurance program for the air quality sampling network.

In 1977, all tape samplers were recommended to be discontinued because of rising costs and changes in monitoring priorities. New monitoring sites were established in Clinton, Council Bluffs, Creston, Des Moines, and Ottumwa and a background station was established at Backbone State Park in Northeast Iowa. In addition, the annual statewide review of the air monitoring network

conducted by DEQ in 1977 recommended a phase-out of sulfur dioxide bubblers and installation of new continuous sulfur dioxide monitors, expansion of the ozone monitoring network, and addition or relocation of eight hi vol particulate samplers during 1978.

III. POLLUTANT DESCRIPTIONS AND MONITORING METHODS

Suspended Particulates

Any solid or liquid matter of relatively small particle size (usually .001 to .1 millimeters) that tends to stay suspended and dispersed in the atmosphere for a significant length of time is considered a suspended particulate. Suspension time may vary from a few seconds to several months, depending on particle size. Sources of this pollutant include combustion, industrial processes, agricultural activities, and unpaved roads.

Particulate pollution has adverse affects on climate, property, vegetation and human health. Large concentrations of particulate matter promote cloud formation and reduce solar radiation, thus causing possible climate changes. Atmospheric particles may accelerate corrosion of iron, steel, and various nonferrous metals, disfigure and damage building materials, and soil painted and textile surfaces. Particulates may prevent normal plant growth by intercepting light needed for photosynthesis. It has also been shown that suspended particulates will cause or promote respiratory ailments.

The method of collection consists of a high volume vacuum pump motor that is designed to continuously draw a large volume of air (1 to 2 cubic meters/min.) through a preweighed glass fiber filter for a 24-hour period (usually midnight to midnight). The sample filter is then sent to the laboratory, where it is held at least 24 hours at 75^{0} F and less than 50% relative humidity before it is weighed again. The weight difference is the amount of particulates, measured in micrograms. Combined with the calculated volume of air

that passed through the filter during the 24 hour period, the amount of suspended particulate matter can be expressed in micrograms per cubic meter. Minimum detectable limit for this method is one microgram per cubic meter.

Sulfur Oxides (Sulfur Dioxide)

Sulfur oxides are common atmospheric pollutants that consist of sulfur dioxide, sulfur trioxide, and the corresponding acids and salts (sulfites and sulfates). The most common sulfur oxide monitored is sulfur dioxide (SO_2).

Sulfur oxides have adverse effects on property, vegetation, and human health. Much of the damage to property and vegetation is due to the conversion of sulfur oxides to highly reactive sulfuric acid. This acid tends to accelerate both corrosion in metals and decay in building materials, textile fibers, leather, and other miscellaneous materials. The sulfuric acid will cause injury to leaf tissues, thus suppressing vegetative growth and yield. Sulfur oxides have also been shown to cause irritation of the human respiratory system, producing possible temporary or permanent injury.

The 24-hour sampling method collects sulfur dioxide by bubbling ambient air samples through an absorbing solution of potassium tetrachloromercurate. This collected sample then is analyzed in the laboratory by adding pararosaniline and formaldehyde which react with the complexed sulfur ion to form a red/purple color. The intensity of the color is proportional to the sulfur dioxide that was originally absorbed out of the bubbled air. This color intensity is measured spectrophotometrically and results are reported in micrograms per cubic meter. The detection limit for this method is five micrograms per cubic meter.

The continuous sulfur dioxide instrumentation method used at stations in Iowa is the Environmental Protection Agency reference method known as the coulometric method. It involves the detection of electric current differences in an electrochemical reaction. This reaction occurs in a cell containing platinum electrodes and a potassium iodide solution. Ambient air is bubbled through this detection cell at a known rate of flow, and the sulfur dioxide in the sample changes the electrical properties of the solution. A detectable electric current between the platinum electrodes results, which is proportional to the sulfur dioxide concentration in the continuously drawn sample of ambient air. The results are reported in parts per million. The detection limit for this method is 26 micrograms per cubic meter.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, tasteless gas that is very flammable. It is the most commonly occuring air pollutant, with total emissions exceeding all other pollutants combined.

Carbon monoxide is produced by both natural sources and technological sources. In nature, CO has been found to be produced from volcanos, natural gases from coal mines, electrical storms and lightning related forest fires. Small quantities are also formed during some seed germinations and aquatic plant growth. The largest quantities of carbon monoxide, however, are the result of fuel combustion in mobile sources utilizing the internal combustion engine.

Since carbon monoxide is a toxic gas, large concentrations can be fatal to humans and animals. Carbon monoxide, like oxygen, reacts with hemoproteins in the blood; an increase in carbon monoxide exposure will cause a decrease of oxygen in the blood. A lack of oxygen in the blood for extended periods of

time may cause damage to the brain, central nervous system, and cardiovascular system and may eventually cause death.

Monitoring for carbon monoxide is done on a continuous basis using instrumentation based on the ability of the carbon monoxide molecule to absorb infrared radiation of a specific wavelength. A beam of infrared radiation is split into two paths; one is passed through a cell containing a sample of air, the other is used as a reference. After the beam passes through the air sample, the difference in the radiation intensities of the two beams is measured, using a special detector that is sensitive to varying levels of this radiation. The output of this detector is an electronic signal that is proportional to the carbon monoxide in the air sample reported in milligrams per cubic meter. Minimum detectable concentration is equal to 0.6 milligrams per cubic meter.

Photochemical Oxidants (Ozone)

Ozone is one of the highly reactive oxidants that is produced in the atmosphere by the chemical combination of hydrocarbons, nitrogen oxide and sunlight. Ozone is not only a pollutant in itself, but, because it is almost entirely produced as a result of other pollutants (NO_2 and Hydrocarbons), it serves as an indicator of their presence. In addition, ozone is more reliably monitored than the pollutants that cause its formation.

Photochemical oxidants have adverse effects on property, vegetation, and human health. Ozone is reactive with rubber, cellulose in textile fabrics, and certain dyes, causing decay or chemical alteration. In vegetation, oxidants have been shown to cause injury to leafy vegetables and field crops by destroying plant cells. This effect increases growth alterations, reduces yields and changes the quality of plant products. Photochemical oxidants will also cause injury to humans by altering or impairing normal respiratory processes.

The continuous detector method used is chemiluminescence. In this method, the air sample is mixed with ethylene gas in a reaction chamber. If there is ozone in the sample, it will combine with the ethylene in a photochemical reaction. Light is emitted from the reaction at a rate proportional to the amount of ozone present. This light energy is measured in a photomultiplier tube which gives results indicative of levels of ozone in parts per million (ppm). The minimum detectable concentration is 0.001 ppm.

There is also a bubbler method for detecting all oxidants (ozone is a specific oxidant, others are chlorine and hydrogen peroxides). Air samples are bubbled through an absorbing solution of sodium hydroxide and potassium iodide which is mixed with sulfuric acid and phosphoric acid later in the laboratory to produce a yellow color proportional to the oxidant level. This color is also measured spectrophotometrically.

Nitrogen Oxides (Nitrogen Dioxide)

Nitrogen oxides are atmospheric pollutants that consist of nitric oxide, nitrogen dioxide, and other less significant oxides of nitrogen. The only nitrogen oxide present in the atmosphere in appreciable concentrations is nitrogen dioxide. Nitrogen dioxide is a reddish-orange-brown gas that has a pungent odor. It is very corrosive, highly oxidizing, and is irritating and toxic.

Nitrogen oxides are produced from fuel combustion. Fossil fuel burning stationary sources and fuel combustion from mobile sources are the two largest contributors. A small amount of nitrogen oxides are also produced naturally by bacterial action.

Textile dyes, natural and synthetic fibers, and metals have been shown to be affected by nitrogen oxides. Nitrogen dioxide has been shown to cause injury to vegetation by destroying plant cells. This effect increases growth alterations, reduces yields, and changes the quality of the plant products. In humans, nitrogen oxides, like ozone, will cause injury by altering or impairing normal respiratory processes.

The method for monitoring nitrogen dioxide is a 24-hour bubbler method which is now only a tentative EPA reference method. It consists of an absorbing solution of sodium hydroxide-sodium arsenite which is later reacted with phosphoric acid, sulfanilamide and other compounds to form a dye which can be evaluated colorimetrically. The results are reported in micrograms per cubic meter, with the minimum detection capability of five micrograms per cubic meter.

Hydrocarbons

Hydrocarbons are organic compounds that consist of atoms of hydrogen and carbon. Many of these compounds enter into photochemical reactions and produce photochemical air pollutants.

Hydrocarbons originate primarily from incomplete fuel combustion (e.g. carburated gasoline engines), organic solvent loss (e.g. chemical manufacturing, rubber and plastic production, paint, varnish and lacquer usage, and dry cleaning materials), and petroleum production, processing, storage and transfer.

Since many hydrocarbons enter into the formation of photochemical air pollution, effects on materials, vegetation, and humans are similar to that of photochemical oxidants.

The Environmental Protection Agency has not established a reference method for monitoring hydrocarbons. However the method used in Iowa involves gas chromography with flame ionization detection. Since the principle hydrocarbon component, methane, is inert in photochemical reaction, it is desirable to monitor it separately to obtain an accurate measurement of photochemically reactive hydrocarbons. A quantity of ambient air is passed through a separating column to separate the methane from the other hydrocarbons. This methane gas is measured by a flame ionization detector. A second quantity of ambient air is passed directly to the flame ionization detector to measure total hydrocarbons. Total non-methane hydrocarbons are then calculated by subtracting the measured methane value from the total hydrocarbon value.

IV. AIR MONITORING NETWORK

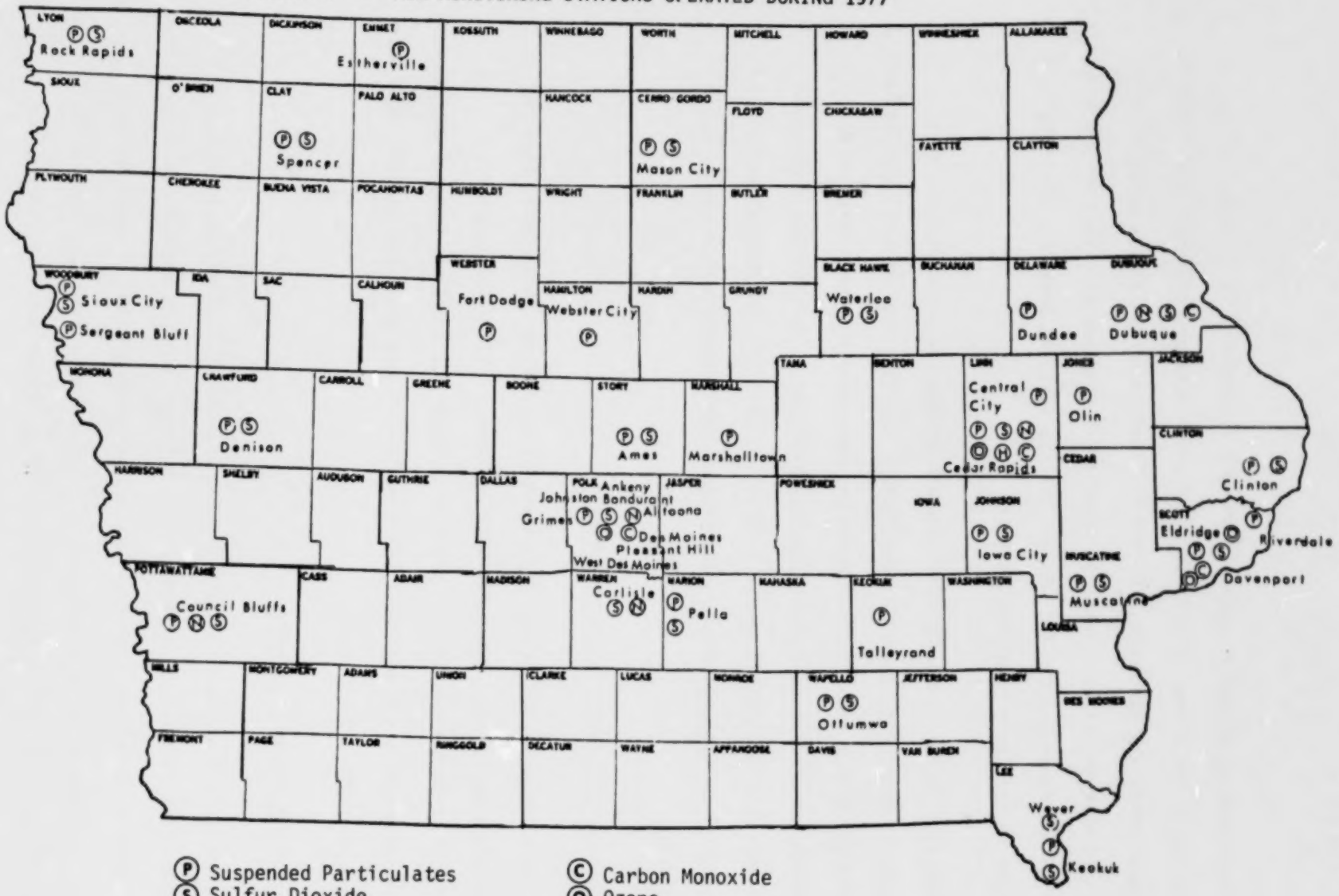
The 1977 Iowa Air Monitoring Network consisted of 112 monitors at 68 sites in 37 cities. Five new monitoring sites began operation in 1977 and eight new sites are currently planned to begin operation in 1978. To ensure that sampling locations meet EPA guidelines the network was thoroughly reviewed in 1977. At some of the existing sites, the monitors were repositioned or the sampler inlets were modified to comply with federal recommendations. Continued review is expected in the future to improve the monitoring network and monitoring data. Figure 1 shows the cities in Iowa that are currently being monitored by the state or local programs and the pollutants monitored in those cities.

Monitor operations were conducted by six agencies in Iowa in 1977: State Hygienic Laboratory (SHL), Des Moines-Polk County Health Department (DMPC), Linn County Health Department (LCHD), Quad Cities Area Regional Air Pollution Control Board (QCAP), Scott County Health Department (SCHD) and Environmental Protection Agency's National Air Surveillance Network (EPA). These agencies were responsible for monitor maintenance, data acquisition, and data reporting.

State Hygienic Laboratory

The largest part of the State's air monitoring is conducted by the State Hygienic Laboratory. In 1977, SHL maintained a fixed monitoring network consisting of 43 hi-volume samplers, 14 sulfur dioxide gas bubblers, 8 continuous sulfur dioxide monitors, 1 nitrogen dioxide gas bubbler, 7 coefficient of haze tape samplers and 2 carbon monoxide monitors. During 1977, the State Hygienic Laboratory again expanded the fixed station network. Four new hi-volume samplers and one new continuous sulfur dioxide monitor were located throughout the State for additional monitoring data. Two of the four new hi-volume

FIGURE 1 - AIR MONITORING STATIONS OPERATED DURING 1977



monitors were necessary to complete changes recommended in a study that was conducted in the summer of 1975 that indicated improper placement and location of some monitoring equipment. During 1975 and early in 1976, a total of 42 monitors were installed, moved, or adjusted in some way as a part of DEQ's quality assurance program for the air quality sampling network. The remaining network changes were completed in 1977.

In addition to the fixed stations, the SHL maintained a mobile laboratory capable of monitoring suspended particulates (both hi-volume and tape sampler), continuous sulfur dioxide, continuous nitrogen dioxide, continuous carbon monoxide, continuous non-methane hydrocarbons and wind speed and direction. This mobile unit makes it possible to survey all types of problem areas and to respond to emergency situations for which fixed station monitoring is not available.

Des Moines-Polk County Health Department

Des Moines-Polk County Health Department is one of the three local agencies conducting monitoring. In 1977, DMPC operated 12 hi-volume samplers, 5 sulfur dioxide gas bubblers, 5 nitrogen dioxide gas bubblers, 2 ozone monitors, and 2 carbon monoxide monitors. This monitoring equipment was located in eight cities throughout Polk County.

Linn County Health Department

Linn County's fixed monitoring network consisted of 6 hi-volume samplers, 2 continuous sulfur dioxide monitors, 1 nitrogen dioxide gas bubbler, 1 coefficient of haze tape sampler, 1 carbon monoxide monitor, 1 ozone monitor and 1 non-methane hydrocarbon monitor. Except for a hi-volume sampler in Central City, all of the monitoring equipment listed above was located in Cedar Rapids.

Quad Cities Area Regional Air Pollution Control Board and the Scott County Health Department

In cooperation with the State Hygienic Laboratory, the Quad Cities Area Regional Air Pollution Control Association and the Scott County Health Department operated 4 hi-volume samplers, 1 sulfur dioxide continuous monitor, 1 sulfur dioxide gas bubbler, 2 coefficient of haze tape samplers and 2 total oxidant monitors in the Davenport area. This monitoring equipment includes a mobile monitoring unit donated to the local agency by Iowa-Illinois Gas and Electric. This unit is equipped to monitor suspended particulates, sulfur dioxide, total oxidants, carbon monoxide, wind speed, wind direction, and temperature. The Quad Cities agency was also responsible for reporting data to the Illinois Environmental Protection Agency.

National Air Surveillance Network

The U.S. Environmental Protection Agency's National Air Surveillance Network consisted of five sites in Iowa. All sites had a hi-volume sampler and two sites, Des Moines and Dubuque, also had a sulfur dioxide gas bubbler and nitrogen dioxide gas bubbler. All samples were analyzed by EPA and reported to the state agency. In late 1977 the EPA decided to discontinue federal operation of all NASN sites and requested each state to continue any site they felt was important. Therefore on January 1, 1978, the SHL assumed responsibility for the NASN sites in Davenport and Dubuque. The remaining three sites were discontinued although Des Moines and Cedar Rapids have been operating monitors adjacent to the NASN monitors and will continue to use these locations.

V. DATA SUMMARY

Data Statistics

To present the monitoring data in a compact, understandable, and reasonable form, basic statistical formulas are used to process the hourly and daily monitoring values. Annual means are calculated for each pollutant to obtain average concentrations. Many of the national stanards are based on this annual mean. An annual geometric mean is calculated for suspended particulates since the individual monitoring values are distributed log-normally. A deviation is also calculated to estimate the amount of variance from the mean that the monitors have recorded.

After monitoring a random number of samples, there may be a value that does not fit properly into the set because it is too large or too small. This number is called an outlier and a simple statistical test can determine if this outlier should be rejected and therefore eliminated from the annual mean calculations. All of the monitoring data is given this test, known as the T-Test, to determine the outliers.

Some high values occur because of unusual atmospheric conditions but cannot be rejected by statistical methods. These values must receive special recognition. Section VII describes one of these unusual events that occurred in 1977.

Also during 1977 a special correction was made to the suspended particulate data for temperature differences created from calibrating the monitor at one temperature and running the monitor at a variety of temperatures. In most cases the correction factor is small and generally lowers the original concentration. All data prior to 1977 does not reflect this correction.

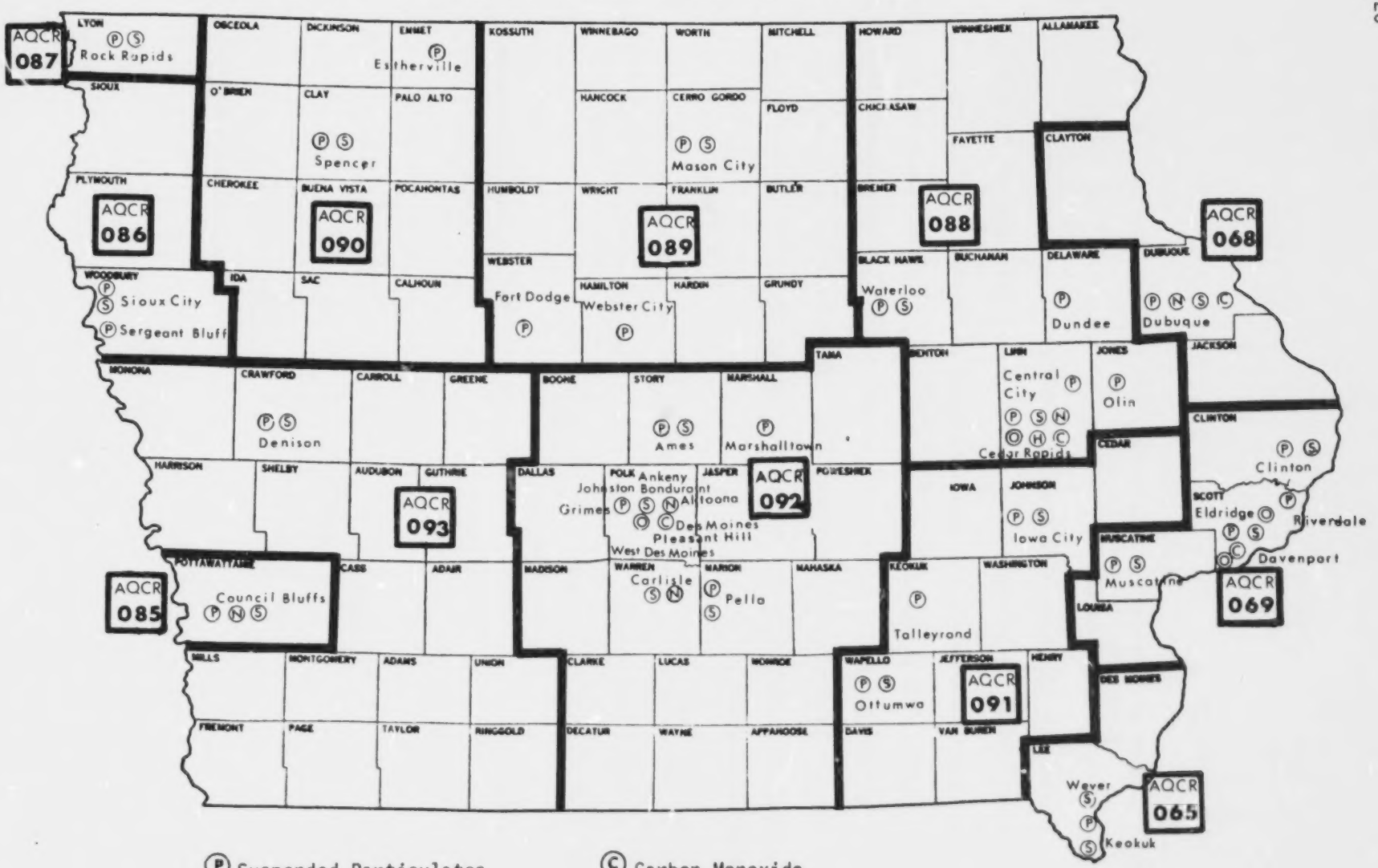
Data Interpretation

A compilation of air monitoring data through 1977 is listed by Air Quality Control Region (AQCR). The EPA developed an AQCR network for the United States in 1970 for the purpose of developing and enforcing state implementation plans for air pollution prevention. Figure 2 shows a breakdown of the AQCR's in Iowa. Each section of monitoring data to follow consists of a map of the AQCR showing cities where air quality monitoring is being conducted, a directory of monitoring sites, and table of monitoring data recorded at each site. In the tables of monitoring data, years that should not be used as an annual mean representative of air quality for that year are designated by an asterisk (*).

The tables of monitoring data list the statistics needed to compare these data with national standards. In most cases the number of violations of the national standards are also listed in these tables.

Figure 2 may be used to locate cities and AQCR's in which monitoring equipment is located.

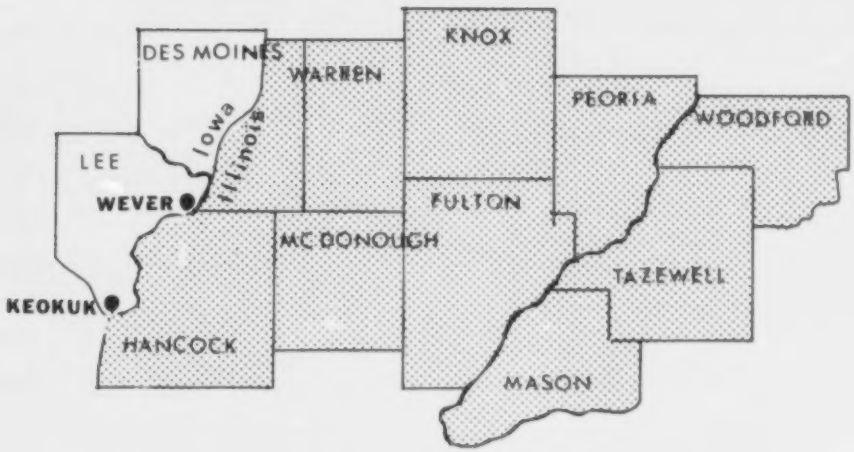
FIGURE 2 - AIR QUALITY CONTROL REGIONS (AQCR) FOR IOWA



AQCR 065

BURLINGTON – KEOKUK INTERSTATE

IOWA – ILLINOIS



The air quality in the Iowa portion of the Burlington-Keokuk Interstate Region showed improvement in 1977 when compared with previous years. All three sites in Keokuk monitoring suspended particulates were lower in 1977 when compared with the 1976 figures. The water pollution control plant showed the largest decline in annual levels primarily due to the completion of construction around the site that elevated levels in 1976.

Sulfur dioxide levels were again low for all monitoring sites in this region. No violations of the national sulfur dioxide standards were recorded. Because of the extremely low levels recorded in Wever, the monitoring location was discontinued in November.

AQCR 065 BURLINGTON-KEOKUK INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Des Moines County				
Wever Pump House		SHL	SO_2 Cont.	Industrial
Lee County				
Keokuk Water Pollution Control Plant	1000 Mississippi Dr.	SHL	Hi-Vol SO_2 Bubbler Tape Sampler	Industrial
Keokuk Water Treatment Plant	415 Blondeau St.	SHL	Hi-Vol	Commercial
Keokuk High School	Washington & Middle Road	SHL	Hi-Vol	Residential
Keokuk Fire Station	13th & Johnson St.	SHL	Hi-Vol SO_2 Bubbler	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Lee County									
Keokuk Water Pollution Control Plant	1970*	7	327.0	262.0	2	2	174	159	1.56
	1971*	17	840.0	559.0	2	2	145	86	2.00
	1972	38	667.0	655.0	11	6	166	118	2.27
	1973	40	648.5	351.0	17	5	156	119	1.93
	1974	54	458.0	377.0	18	5	133	97	2.17
	1975	54	387.0	377.0	19	7	143	118	1.90
	1976	54	906.0	510.0	33	11	206	171	1.86
	1977*	38	335.9	319.1	11	4	124	104	1.85

* Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Lee County									
Keokuk Water Treatment Plant	1971*	7	95.8	73.9	0	0	58	55	1.40
	1972	50	299.0	150.0	1	1	73	64	1.65
	1973	43	223.0	221.0	5	0	85	74	1.58
	1974	56	196.0	157.0	2	0	75	67	1.64
	1975	58	202.0	147.0	1	0	78	71	1.58
	1976	6	132.0	124.0	0	0	76	64	1.94
Keokuk High School	1976*	32	229.0	144.0	1	0	70	64	1.48
	1977	53	175.8	119.3	1	0	59	53	1.59
Keokuk Fire Station	1976*	42	296.0	155.0	2	1	88	80	1.52
	1977	50	174.0	155.1	2	0	78	70	1.65

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	Number of Samples	Maximum 2-Hour	Second Maximum 2-Hour	Arithmetic Mean
Lee County					
Keokuk Water Pollution Control Plant	1973	4204	0.91	0.82	0.08
	1974	4856	0.82	0.74	0.09
	1975	2255	1.22	1.09	0.10
	1976	3494	1.44	1.13	0.10
	1977*	1755	1.40	1.31	0.11

* Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Lee County						
Keokuk	1973*	35	103.0	67.0	0	10.0
Water Pollution	1974	55	1240.0	338.0	1	70.6
Control Plant	1975	50	273.0	151.0	0	25.8
	1976*	5	417.8	51.1	1	101.3
Keokuk	1976*	41	55.3	29.6	0	8.7
Fire Station	1977	50	48.2	47.8	0	15.1

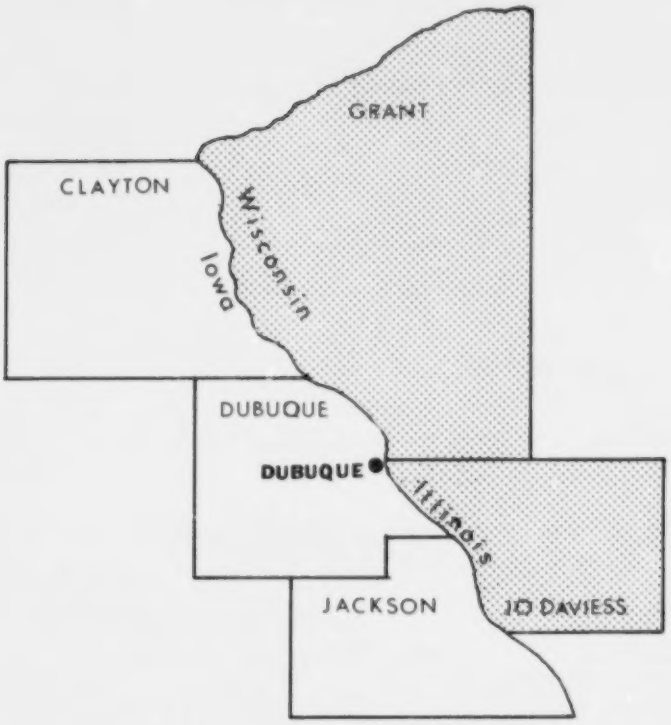
SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 3-Hour	Second Maximum 3-Hour	Number of Samples Exceeding 3-Hour Standard	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arith Mean
Lee County									
Wever									
Pump House	1973*	2473	379	347	0	159	37	0	7
	1974	7037	489	356	0	180	140	0	12
	1975	5567	166	52	0	35	33	0	7
	1976	8251	52	51	0	37	31	0	1
	1977*	7142	10	9	0	3	2	0	0

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 068

METROPOLITAN DUBUQUE INTERSTATE
IOWA—WISCONSIN—ILLINOIS



The air quality in the Iowa portion of the Metropolitan Dubuque Interstate Region showed improvement for suspended particulates in 1977 when compared with the previous year. All sites continued to be below the 24-hour and annual suspended particulate standards. Annual geometric means averaged over seven micrograms per cubic meter lower in 1977 than in 1976, mainly because of the wet weather in the last five months of the year.

A new air quality problem developed in 1977 in Dubuque. Sulfur dioxide levels increased dramatically with five violations of the 24-hour sulfur dioxide standard being recorded during the year. These monitored values surpassed the highest sulfur dioxide levels ever recorded in Iowa. The primary cause of these high levels has not been determined, however, extensive modeling is currently being conducted for every known source of sulfur dioxide to determine if any source or combination of sources could produce these levels.

Except for the unusually high sulfur dioxide levels in Dubuque, the air quality in the region is very good.

AQCR 068 METROPOLITAN DUBUQUE INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Dubuque County				
Dubuque City Garage	925 Kerper	SHL	Tape Sampler	Industrial
Dubuque Fire Station #4	University & Atlantic	EPA	Hi-Vol	Residential
Dubuque Eagle Pt. Pump Station	Hawthorne & Rhomberg	SHL	Hi-Vol SO_2 Cont.	Industrial
		EPA	Hi-Vol SO_2 Bubbler NO_2 Bubbler	
Dubuque Pixler Electric	11 Bluff Street	SHL	CO Cont.	Commercial
Dubuque Post Office	305 West Sixth Street	SHL	Hi-Vol	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Dubuque County									
Dubuque Fire Station #4	1964	24	161.0	107.0	1	0	74	67	1.63
	1967*	25	163.0	-	1	0	60	54	1.59
	1968*	15	222.0	-	1	0	61	46	2.27
	1969	23	268.0	124.0	1	1	79	70	1.63
	1970*	11	383.0	202.0	3	1	132	107	1.96
	1971*	3	139.0	111.0	0	0	93	89	2.17
	1972	24	231.0	174.0	3	0	76	64	1.76
	1973*	5	102.0	53.0	0	0	52	47	1.63
	1974	28	112.0	102.0	0	0	56	49	1.74
	1975	32	93.0	88.0	0	0	44	38	1.81
	1976	54	174.0	120.0	1	0	53	47	1.66
	1977*	44	100.0	85.0	0	0	35	32	1.60

* Do not as annual statistics representative of air quality for that year because four valid quarters are not available.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Dubuque County									
Dubuque Eagle Pt. Pump Station	1973*	4	39.0	36.0	0	0	31	30	1.32
	1974	28	134.0	132.0	0	0	53	44	1.82
	1975	33	126.0	119.0	0	0	46	39	1.76
	1976	53	246.0	196.0	2	0	61	52	1.69
	1977	46	140.0	111.0	0	0	53	48	1.62
Dubuque Eagle Pt. Pump Station	1976*	24	180.0	151.0	2	0	57	59	1.65
	1977	49	161.0	144.0	1	0	59	51	1.67
Dubuque Post Office	1976*	39	245.0	133.0	1	0	78	67	1.66
	1977	61	137.0	131.0	0	0	63	56	1.66

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	Number of Samples	Maximum 2-Hour	Second Maximum 2-Hour	Arithmetic Mean
Dubuque County					
Dubuque City Garage	1973*	442	1.27	1.09	0.15
	1974	2316	0.91	0.82	0.09
	1975*	1083	1.18	1.00	0.10
	1976	1394	1.04	1.00	0.17
	1977*	1124	0.36	0.32	0.07

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Parts Per Million)

Site Location	Year	Number of Samples	Max. 1-Hour	2nd Max 1-Hour	No. of Samples Exceeding Standard	Max. 8-Hour	2nd Max 8-Hour	No of Samples Exceeding Standard	Arith Mean
Dubuque County									
Dubuque Pixler Electric	1975	4165	13.2	12.7	0	10.6	6.9	1	1.9
	1976*	4002	10.7	10.4	0	9.0	8.7	0	2.5
	1977	5584	14.2	13.4	0	7.5	7.2	0	2.0

* Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24 Hour	2nd Maximum 24 Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Dubuque County						
Dubuque (EPA)	1974*	26	121.0	36.0	0	16.1
Eagle Pt. Pump	1975	32	112.0	73.0	0	24.7
Station	1976	51	56.0	56.0	0	16.0
	1977	49	81.0	46.0	0	10.8

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 3-Hour	Second Maximum 3-Hour	Number of Samples Exceeding 3-Hour Standard	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arith Mean
Dubuque County									
Dubuque									
Eagle Pt.	1973*	753	318	233	0	102	91	0	32
Pump	1974	4813	624	523	0	354	350	0	53
Station	1975	4140	484	420	0	230	149	0	9
	1976	7139	294	266	0	168	52	0	4
	1977	7660	1368	1158	1	808	463	5	19

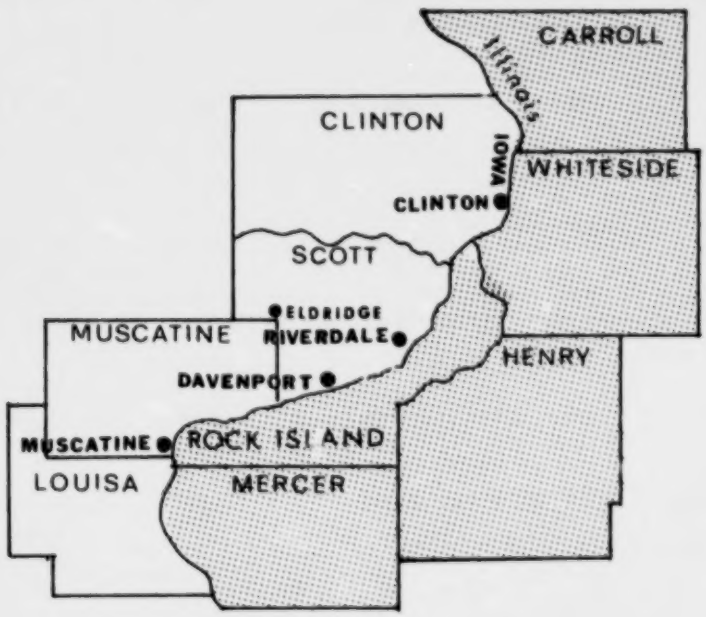
NITROGEN DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Violation of Annual Standard	Arithmetic Mean
Dubuque County						
Dubuque (EPA)	1974*	26	55.0	51.0	No	27.4
Eagle Pt.	1975	34	62.0	43.0	No	24.3
Pump Station	1976	54	80.0	74.0	No	33.1
	1977	44	64.0	51.0	No	25.8

* Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 069

METROPOLITAN QUAD CITIES INTERSTATE
IOWA – ILLINOIS



The air quality in the Iowa portion of the Metropolitan Quad Cities Interstate Region remained constant or showed improvement in 1977 when compared with previous years. Suspended particulate levels showed a decrease at the two monitors that operated all year in Clinton. The sewage treatment plant monitor showed the largest decline primarily because of the completion of construction around the site that elevated the levels the previous year. The Quad Cities suspended particulate levels were similar to the 1976 values except at the Third and Pershing location which dropped dramatically for an unknown reason and the Iowa Highway Patrol Station which increased dramatically from normal levels because of a new unpaved commercial road adjacent to the site. The Muscatine suspended particulate monitor also showed a decrease in 1977.

Sulfur dioxide levels were again low with most sites showing a decrease in 1977. Carbon monoxide levels were nearly identical to the values recorded in 1976, however, two violations of the eight-hour standard were recorded in 1977 as compared with only one recorded in 1976. Oxidant levels remained relatively constant, however, the Iowa Highway Patrol Station showed a decrease in the number of one-hour violations.

AQCR 069 METROPOLITAN QUAD CITIES INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Clinton County				
Clinton Sewage Treatment Plant	1901 Beaver Channel Parkway	SHL	Hi-Vol	Industrial
Clinton Central Fire Station	North 4th Street & Third Avenue South	SHL	Hi-Vol SO_2	Commercial
Clinton Lyons Junior High School	North 4th Street & 28th Avenue North	SHL	Hi-Vol	Residential
Clinton Public Library	306 Eighth Avenue S.	SHL	Hi-Vol	Commercial
Muscatine County				
Muscatine City Hall	E. 3rd & Sycamore	SHL	Hi-Vol SO_2 Bubbler	Commercial
Scott County				
Davenport Central Fire Station	331 Scott Street	EPA	Hi-Vol	Commercial
Davenport Ia.-Ill. Gas & Electric	Third & Pershing	SHL[a]	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Davenport Monroe School	1946 West Fourth	QCARAPC SCHD	Hi-Vol	Industrial
Davenport Ia. Highway Patrol Station	3200 Elmore Drive	QCARAPC SCHD SHL[a]	Hi-Vol Tape Sampler SO_2 Cont. Total Oxidants CO Continuous	Commercial
Davenport St. Ambrose College	518 West Locust	QCARAPC SCHD	Total Oxidants	Residential
Eldridge High School	200 First St.	SHL[a]	Ozone	Residential
Riverdale Pleasant Valley School	Belmont Road	QCARAPC SCHD	Hi-Vol	Residential

[a]Monitoring equipment maintained by Quad Cities Area Regional Air Pollution Control Board (QCARAPC) and Scott County Health Department (SCHD).

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Clinton County									
Clinton Sewage Treatment Plant	1975	50	265.0	206.0	5	1	80	67	1.81
	1976	60	441.0	288.0	11	5	111	91	1.89
	1977	46	183.3	161.6	2	0	74	67	1.60
Clinton Central Fire Station	1975*	2	47.4	32.2	0	0	40	37	1.31
	1976*	33	328.0	157.0	2	1	73	60	1.84
	1977*	10	149.7	88.2	0	0	73	67	1.56
Clinton Lyons Junior High School	1976*	39	230.0	97.2	1	0	59	51	1.74
	1977	61	141.5	116.9	0	0	49	44	1.55
Clinton Public Library	1977*	8	134.7	87.5	0	0	60	52	1.79
Muscatine County									
Muscatine City Hall	1975*	2	48.4	36.0	0	0	42	42	1.23
	1976	58	279.0	142.0	1	1	84	76	1.57
	1977	60	200.2	190.7	3	0	71	65	1.51
Scott County									
Riverdale Pleasant Valley School	1974	48	148.0	147.0	0	0	63	54	1.75
	1975	60	150.0	106.0	0	0	54	48	1.61
	1976	56	277.0	176.0	2	1	72	63	1.69
	1977	58	146.5	143.0	0	0	68	61	1.57
Davenport Central Fire Station (EPA)	1958	20	276.0	-	-	1	133	125	1.43
	1961	26	237.0	217.0	5	0	111	95	2.00
	1963	25	270.0	251.0	5	1	114	102	2.00
	1964	23	313.0	-	-	-	166	150	1.60
	1966	25	238.0	203.0	8	0	121	109	2.00
	1968	24	291.0	-	-	-	153	139	1.56
	1969	26	319.0	288.0	13	4	170	152	2.00
	1970	25	302.0	296.0	14	3	165	148	1.65
	1971*	23	1128.0	865.0	-	5	239	169	2.22
	1972	26	340.0	326.0	12	3	147	127	1.77
	1973*	5	156.0	81.0	1	0	74	64	1.77
	1974	28	228.0	193.0	7	0	114	101	1.78
	1975	35	207.0	198.0	3	0	94	84	1.64
	1976	53	264.0	173.0	2	1	86	77	1.57
	1977	53	220.0	163.0	3	0	87	80	1.48

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Scott County									
Davenport									
Ia.-Ill.	1970*	27	229.0	183.0	6	0	119	112	1.42
Gas & Electric	1971*	32	350.0	270.0	6	2	117	101	2.00
	1972	55	230.0	216.0	7	0	109	101	1.47
	1973	56	228.0	220.5	16	0	119	107	1.72
	1974	44	194.0	194.0	6	0	94	84	1.63
	1975	54	225.0	182.0	3	0	91	85	1.49
	1976	60	269.0	265.0	8	2	104	93	1.60
	1977	61	223.2	138.9	1	0	73	68	1.48
Davenport									
Monroe School	1974	58	211.0	201.0	8	0	95	78	1.78
	1975	59	151.0	136.0	0	0	67	61	1.59
	1976	61	249.0	160.0	2	0	77	68	1.67
	1977	61	252.0	158.0	2	0	79	72	1.54
Davenport									
Ia. Highway	1974*	47	184.0	156.0	3	0	68	61	1.61
Patrol Station	1975	56	166.0	166.0	3	0	66	58	1.61
	1976	59	1040.0	934.0	11	6	139	95	2.19
	1977	55	1017.6	832.4	24	19	239	148	2.83

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	Number of Samples	Maximum 2 Hour	2nd Maximum 2 Hour	Arithmetic Mean
Scott County					
Davenport					
Ia.-Ill. Gas & Electric	1973*	1944	0.91	0.82	0.16
	1974	3022	1.18	1.18	0.13
	1975	3422	2.70	1.30	0.19
	1976	4165	1.90	1.60	0.28
	1977*	1857	1.30	1.20	0.28
Davenport					
Ia. Highway Patrol Station	1974*	1970	1.90	1.70	0.27
	1975	4343	1.30	1.30	0.23
	1976	4139	1.80	1.60	0.22
	1977	3903	2.20	1.80	0.21

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Muscatine County						
Muscatine						
City Hall	1975*	1	12.5	-	0	12.5
	1976	60	152.0	144.0	0	19.8
	1977	60	95.2	50.0	0	16.4
Scott County						
Davenport						
Ia.-Ill. Gas &	1973	46	31.0	0.0	0	0.7
Electric	1974	52	36.7	15.8	0	6.9
	1975	56	48.2	41.1	0	8.9
	1976	59	81.2	54.3	0	8.7
	1977	61	52.3	49.0	0	13.9

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 3-Hour	Second Maximum 3-Hour	Number of Samples Exceeding 3-Hour Standard	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arith Mean
Clinton County									
Clinton									
Central Fire	1975*	368	1240	660	0	237	22	0	10
Station	1976	7763	1241	596	0	238	138	0	6
	1977	7836	396	390	0	72	53	0	6
Scott County									
Davenport									
Ia. Highway	1974*	2423	260	183	0	149	125	0	30
Patrol	1975	5783	293	267	0	183	175	0	53
Station	1976	7842	379	345	0	233	223	0	63
300 Elmore	1977	6194	237	194	0	147	144	0	35

*Do not use as annual statistics repesentative of air quality for that year because four valid quarters are not available.

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Parts Per Million)

Site Location	Year	Number of Samples	Max. 1-Hour	2nd Max 1-Hour	No. of Samples Exceeding Standard	Max. 8-Hour	2nd Max 8-Hour	No of Samples Exceeding Standard	Arith Mean
Scott County									
Davenport									
Ia. Highway	1976	7820	11.0	11.0	0	9.2	9.0	1	1.8
Patrol	1977	8359	20.0	15.0	0	9.5	9.1	2	1.8

OZONE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 1-Hour	2nd Maximum 1-Hour	Number of Samples Exceeding 1-Hour Standard	Arithmetic Mean
Scott County						
Eldridge						
High School	1977*	4895	190	190	16	41.4

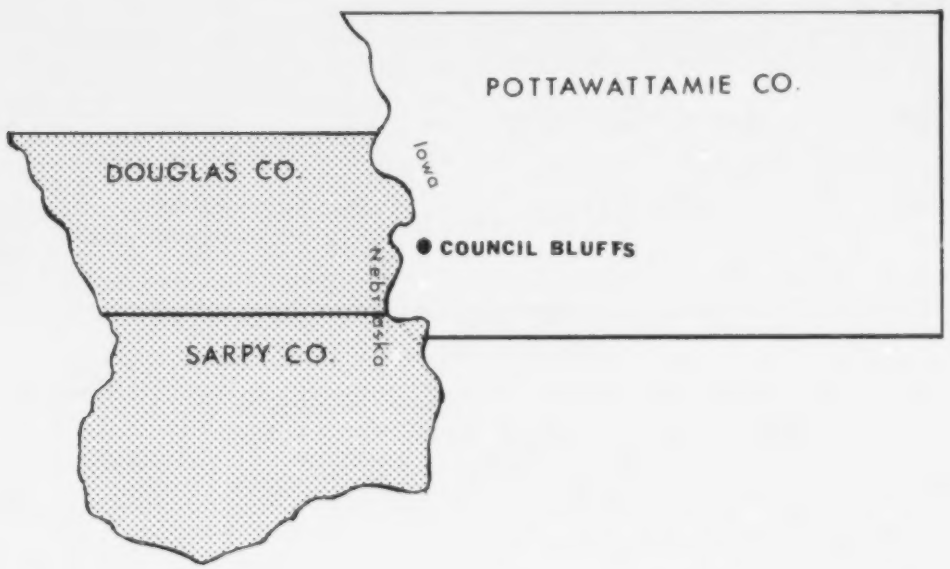
TOTAL OXIDANTS - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of. Samples	Maximum 1-Hour	2nd Maximum 1-Hour	Number of Samples Exceeding 1-Hour Standard	Arithmetic Mean
Scott County						
Davenport						
Ia. Highway	1974*	3866	140	140	0	35
Patrol Station	1975	8491	202	190	20	50
	1976	8466	198	196	26	54
	1977	8261	226	212	13	51
Davenport						
St. Ambrose	1976	5980	212	208	3	58
College	1977*	4067	196	192	0	59

* Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

AQCR 085

METROPOLITAN
OMAHA — COUNCIL BLUFFS INTERSTATE
IOWA—NEBRASKA



The air quality in the Iowa portion of the Metropolitan Omaha-Council Bluffs interstate region improved when compared with the 1976 air monitoring data. All suspended particulate sites showed a decrease in annual levels in 1977. However, these levels still remain above the national primary standard. The Dodge Park Lift Station monitor was moved to Longfellow School in June, 1977, therefore both sites have insufficient data to use for annual statistics. Annual and 24-hour sulfur dioxide levels showed a decrease in 1977 while nitrogen dioxide levels remained constant.

AQCR 085 METROPOLITAN OMAHA-COUNCIL BLUFFS INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Pottawattamie County				
Council Bluffs City Hall	209 Pearl St.	SHL	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Council Bluffs Dodge Park Lift Station	Dodge Park	SHL	Hi-Vol NO_2 Bubbler	Industrial
Council Bluffs Water Works Building	2000 N. 25th St.	SHL	Hi-Vol	Residential
Council Bluffs Longfellow School	915 20th Avenue	SHL	Hi-Vol NO_2 Bubbler	Residential

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Pottawattamie County									
Council Bluffs City Hall	1970*	17	233.0	190.0	4	0	122	99	1.48
	1971*	18	205.0	136.0	1	0	101	96	1.52
	1972*	21	217.0	176.0	6	0	116	94	2.39
	1973*	42	243.0	218.9	9	0	114	103	1.66
	1974	51	293.0	293.0	15	3	133	121	1.56
	1975	33	337.0	282.0	10	3	132	115	1.72
	1976	45	264.0	218.0	6	1	114	106	1.51
	1977*	42	243.3	193.1	5	0	91	82	1.60
Council Bluffs Dodge Park Lift Station	1973*	31	188.0	178.0	2	0	77	65	1.85
	1974	53	744.0	587.0	12	4	129	99	1.92
	1975	35	263.0	211.0	7	1	109	95	1.75
	1976*	30	522.0	508.0	14	5	182	150	1.94
	1977*	15	228.0	165.0	2	0	76	52	2.61
Council Bluffs Water Works Building	1976	48	429.0	283.0	6	3	105	89	1.74
	1977	48	301.9	228.9	8	1	98	85	1.71
Council Bluffs Longfellow School	1977*	16	179.8	104.7	1	0	70	62	1.58

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	Number of Samples	Maximum 2-Hour	Second Maximum 2-Hour	Arithmetic Mean
Pottawattamie County					
Council Bluffs City Hall	1973*	1953	1.02	1.00	0.20
	1974	3229	0.78	0.74	0.12
	1975*	665	0.32	0.28	0.07
	1976*	1716	0.40	0.24	0.06
	1977*	444	0.24	0.20	0.04

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Pottawattamie County						
Council Bluffs City Hall	1973*	35	34.7	29.9	0	1.8
	1974	55	46.2	15.5	0	5.0
	1975	42	41.1	28.7	0	9.4
	1976*	41	39.7	36.7	0	10.6
	1977*	44	32.6	26.4	0	9.1

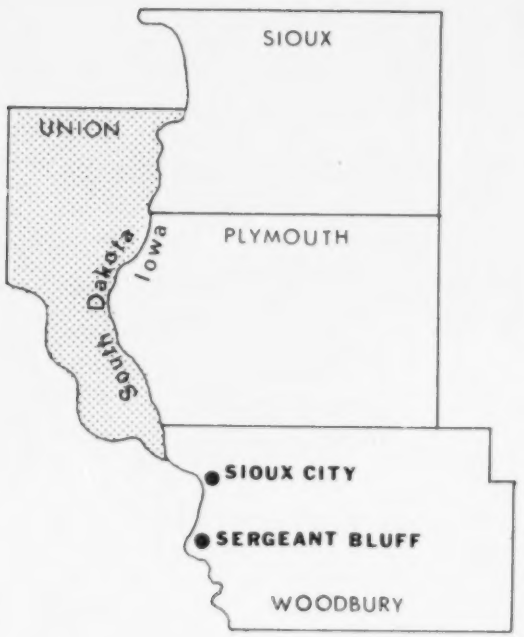
NITROGEN DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Violation of Annual Standard	Arithmetic Mean
Pottawattamie County						
Council Bluffs Dodge Park Lift Station	1973*	25	50.0	45.9	No	24.8
	1974	46	85.7	63.8	No	26.2
	1975	31	42.3	30.9	No	10.6
	1976*	29	104.0	75.2	No	32.9
	1977*	19	67.6	60.5	No	31.5
Council Bluffs Longfellow School	1977*	21	59.0	58.0	No	28.8

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 086

METROPOLITAN SIOUX CITY INTERSTATE
IOWA - SOUTH DAKOTA



The air quality in the Iowa portion of Metropolitan Sioux City interstate region was above the national standards for suspended particulates in the urban areas, while the rural areas appear to be below the national standards. No comparisons between 1977 and previous years can be made to indicate trends because of an inadequate data base. Sulfur dioxide levels were again extremely low with no violations of the short-term or annual standards being recorded.

AQCR 086 METROPOLITAN SIOUX CITY INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Woodbury County				
Sioux City City Hall	405 - 6th St.	SHL	Hi-Vol SO_2 Bubbler	Commercial
Sioux City Fire Station #9	27th & Chambers	SHL	Hi-Vol	Residential
Sioux City Federal Building	320 - 6th St.	SHL	Hi-Vol SO_2 Bubbler	Commercial
Sergeant Bluff Army Guard Armory	Airport	SHL	Hi-Vol	Industrial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Woodbury County									
Sioux City City Hall	1970*	19	131.0	110.0	0	0	76	71	1.44
	1971*	31	168.0	139.0	1	0	79	74	1.49
	1972	50	128.0	120.0	0	0	66	59	1.70
	1973	57	218.0	189.1	5	0	77	66	1.73
	1974	61	151.0	123.0	1	0	58	52	1.61
	1975	53	160.0	135.0	1	0	59	50	1.79
	1976*	37	190.0	142.0	1	0	72	62	1.77
Sioux City Federal Building	1976*	23	177.0	99.6	1	0	66	62	1.43
	1977	57	220.0	218.8	8	0	95	85	1.60
Sioux City Fire Station #9	1976*	49	242.0	234.0	4	0	90	80	1.65
	1977	61	180.0	152.2	4	0	91	84	1.51
Sergeant Bluff Army Guard Armory	1976*	49	236.0	210.0	2	0	74	64	1.79
	1977	60	143.6	133.6	0	0	66	59	1.59

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

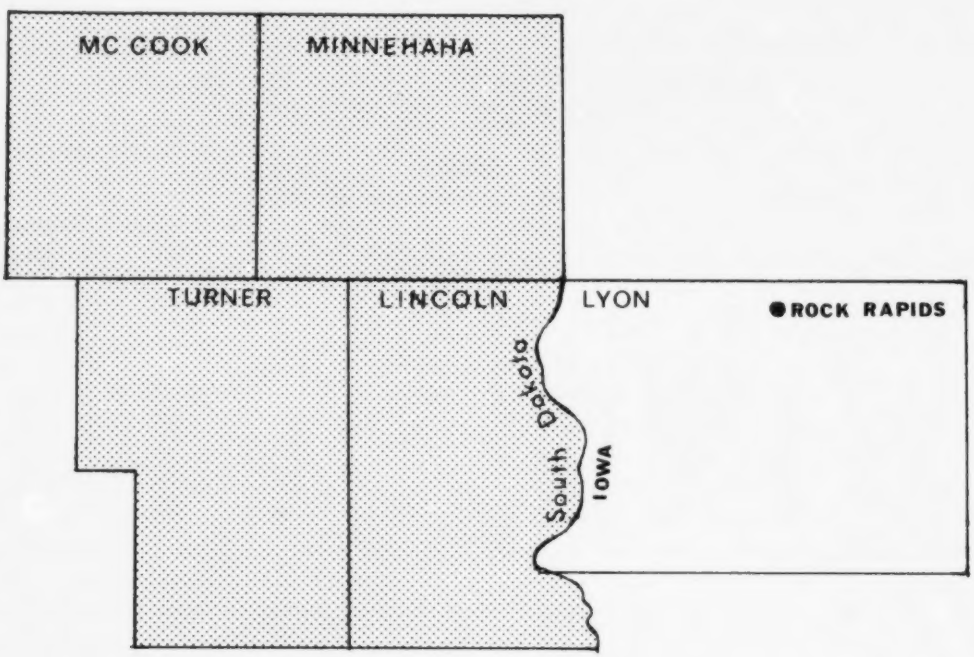
SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24 Hour	2nd Maximum 24 Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Woodbury County						
Sioux City City Hall	1973	40	0	0	0	0.0
	1974	59	21.8	12.5	0	4.1
	1975	55	12.5	12.5	0	4.8
	1976*	36	12.5	12.5	0	6.9
Sioux City Federal Building	1976*	22	12.5	12.5	0	6.3
	1977	56	12.5	12.5	0	7.6

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 087

METROPOLITAN SIOUX FALLS INTERSTATE
IOWA – SOUTH DAKOTA



The air quality in the Iowa portion of the Metropolitan Sioux Falls Interstate Region improved slightly when compared to the 1976 figures. Suspended particulate levels decreased below the annual secondary standard but four violations of the secondary 24-hour standard were recorded. Sulfur dioxide levels remained low with a slight increase in the annual mean being recorded. In general, the air quality in this area was good in 1977.

AQCR 087 METROPOLITAN SIOUX FALLS INTERSTATE REGION

Site Location	Address	Agency	Equipment	Environment
Lyon County				
Rock Rapids Municipal Utilities Bldg.	311 S. 3rd	SHL	Hi-Vol SO_2 Bubbler	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Lyon County									
Rock Rapids Municipal Utilities Building	1973	45	443.4	188.1	3	1	59	43	2.15
	1974	52	185.0	153.0	2	0	68	54	2.13
	1975	48	155.0	154.0	2	0	58	51	1.63
	1976	58	323.0	156.0	2	1	74	62	1.83
	1977	53	210.2	162.5	4	0	67	59	1.64

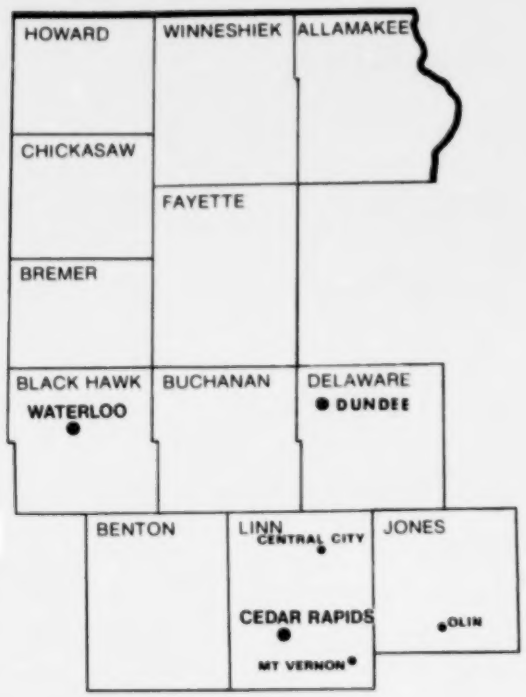
SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24 Hour	2nd Maximum 24 Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Lyon County						
Rock Rapids Municipal Utilities Building	1973*	37	34.0	0.0	0	0.9
	1974	60	43.7	15.4	0	4.9
	1975	55	12.5	12.5	0	5.0
	1976	56	12.5	12.5	0	4.9
	1977	51	12.5	12.5	0	4.9

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 088

NORTHEAST IOWA INTRASTATE



The air quality in the Northeast Iowa Intrastate Region improved in 1977 with large reductions in suspended particulates in all of the cities with monitoring equipment. All four monitoring locations in Waterloo showed a decrease in suspended particulates ranging from 15 to 20 micrograms per cubic meter. Annual levels in Cedar Rapids also decreased at four of the six suspended particulate monitoring sites, with only small increases at the remaining two sites. Olin also showed a decrease in annual levels although the number of twenty-four hour violations increased slightly.

Sulfur dioxide levels in Cedar Rapids and Waterloo continued to be relatively low with no short term or annual violations of the National Standards recorded. The Cedar Rapids monitors showed a reduction in annual levels during 1977. Both carbon monoxide and nitrogen dioxide levels have remained below the standards in Cedar Rapids.

A sharp rise in ozone levels in 1977 in Cedar Rapids has caused concern in this area. Maximum hourly values, samples exceeding the standard and annual means have all increased over 1976 levels. The most dramatic increase occurred with the number of samples greater than the one hour standard, 160 micrograms per cubic meter. The 1977 total is nearly four times the total number of one-hour violations recorded in 1976.

AQCR 088 NORTHEAST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Black Hawk County				
Waterloo Water Plant	3rd and Water	SHL	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Waterloo County Courthouse	316 E. 5th	EPA	Hi-Vol	Commercial
Waterloo St. Mary's Convent	129 East Parker	SHL	Hi-Vol SO_2 Continuous	Residential
Waterloo Fire Station #2	Byron & Randolph Sts.	SHL	Hi-Vol	Residential
Waterloo Northwestern Bell	East Second & Sycamore	SHL	Hi-Vol	Commercial
Jones County				
Olin Fire Station		SHL	Hi-Vol	Residential
Linn County				
Cedar Rapids Noelridge Park	4426 Council St. NE	LCHD	Hi-Vol NO_2 Bubbler	Residential
Cedar Rapids City Garages	445 - First St. SW	LCHD EPA	Hi-Vol Tape Sampler SO_2 - Continuous Hi-Vol	Industrial
Cedar Rapids Jane Boyd Community Center	14th Ave. & 10th St. SE	LCHD	Hi-Vol	Industrial
Cedar Rapids Linn County Health Department	751 Center Point Rd. NE	LCHD	Hi-Vol SO_2 - Continuous CO^2 - Continuous Ozone Non-Methane Hydrocarbons	Industrial
Cedar Rapids Grant Wood Building	4401 Sixth St. SW		Hi-Vol	Commercial

Site Location	Address	Agency	Equipment	Environment
Linn County				
Central City Fire Station	80 Fourth Street	LCHD	Hi-Vol	Residential
Mt. Vernon City Hall	213 First St. W.	LCHD	Hi-Vol	Commercial
Delaware County				
Dundee	Backbone State Park	SHL	Hi-Vol	Background

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Blackhawk County									
Waterloo Water Plant	1970*	23	161.0	158.0	2	0	100	92	1.52
	1971	33	238.0	221.0	4	0	98	86	1.67
	1972*	46	354.0	278.0	12	3	126	107	1.79
	1974	58	174.0	166.0	3	0	85	76	1.67
	1975	58	232.0	188.0	3	0	88	80	1.54
	1976*	5	147.0	124.0	0	0	99	95	1.41
Waterloo 316 E. 5th	1972*	19	249.0	156.0	2	0	114	107	1.40
	1973*	5	99.0	56.0	0	0	57	53	1.42
	1974	29	342.0	130.0	1	1	77	63	1.74
	1975	34	222.0	137.0	1	0	84	75	1.63
	1976	51	230.0	206.0	2	0	91	83	1.55
	1977	48	235.0	140.0	1	0	76	68	1.58
Waterloo Fire Station #2	1976*	35	257.0	108.0	1	0	75	69	1.47
	1977	60	135.0	119.0	0	0	54	49	1.59
Waterloo St. Mary's Convent	1976*	32	271.0	189.0	2	1	91	82	1.56
	1977	61	334.9	165.7	4	1	74	64	1.69
Waterloo Northwestern Bell	1976*	36	299.0	175.0	3	1	93	84	1.52
	1977	56	195.5	141.0	1	0	73	67	1.51

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Jones County									
Olin Fire Station	1970*	5	132.0	106.0	0	0	90	88	1.50
	1971*	8	171.0	133.0	1	0	108	100	2.00
	1972*	25	181.0	179.0	5	0	106	92	1.84
	1973	53	229.0	188.0	4	0	88	79	1.64
	1974	60	220.0	196.0	2	0	74	64	1.79
	1975	54	226.0	172.0	5	0	83	74	1.63
	1976	58	191.0	190.0	5	0	93	82	1.68
	1977*	49	393.3	249.1	8	1	87	71	1.88
Linn County									
Cedar Rapids Noelridge Park	1972*	35	160.0	146.0	1	0	69	60	1.74
	1973	49	228.5	162.3	2	0	78	70	1.58
	1974	55	193.3	149.1	1	0	67	63	1.63
	1975	58	173.0	163.5	3	0	71	62	1.73
	1976	55	400.7	395.7	2	2	84	70	1.75
	1977	54	135.9	133.0	0	0	64	60	1.48
Cedar Rapids City Garage	1972*	38	311.0	230.0	13	1	128	118	1.52
	1973	60	520.5	403.9	17	6	135	111	1.82
	1974	59	379.5	333.6	17	4	133	115	1.75
	1975	55	365.0	219.7	8	1	114	104	1.56
	1976	58	353.8	289.5	13	3	116	98	1.81
	1977	62	267.0	265.3	8	2	95	84	1.65
Cedar Rapids Jane Boyd Comm. Center	1972*	30	256.0	226.0	13	0	130	115	1.67
	1973	49	274.3	263.4	15	2	132	123	1.47
	1974	60	269.3	252.2	16	1	111	104	1.65
	1975	55	211.9	208.0	13	0	112	101	1.62
	1976	60	449.7	311.1	12	2	119	106	1.61
	1977	59	371.0	175.2	5	1	94	85	1.54
Cedar Rapids Linn County Health Dept.	1973	32	446.1	344.5	14	4	170	152	1.60
	1974*	15	248.7	175.7	4	0	130	123	1.42
	1975	45	314.8	305.0	14	3	139	126	1.54
	1976	59	269.6	209.5	11	1	108	99	1.56
	1977	57	446.0	361.5	15	2	126	109	1.70
Cedar Rapids Grantwood Bldg.	1976*	24	333.7	173.3	2	1	105	94	1.59
	1977	47	434.0	230.5	5	1	87	74	1.70

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Linn County									
Cedar Rapids City Garages (EPA)	1970	23	238.0	-	-	0	117	111	1.45
	1971*	22	154.0	-	-	0	103	100	1.34
	1972	30	253.0	203.0	5	0	110	102	1.48
	1973*	4	102.0	60.0	0	0	64	59	1.51
	1974	23	278.0	232.0	4	1	101	85	1.80
	1975	33	162.0	161.0	2	0	93	87	1.45
	1976	54	337.0	271.0	9	3	99	81	1.89
	1977	46	202.0	160.0	2	0	82	73	1.64
Central City Fire Station	1973*	10	160.7	118.7	1	0	96	91	1.38
	1974*	13	236.0	149.5	1	0	80	58	2.35
	1975*	15	313.1	139.2	1	1	94	77	1.75
	1976*	13	176.1	164.5	3	0	108	100	1.51
	1977*	7	138.5	133.8	0	0	83	73	1.78
Mt. Vernon City Hall	1973*	10	96.3	81.7	0	0	68	67	1.24
	1974*	13	162.9	129.5	1	0	65	53	1.94
	1975*	16	139.0	126.7	0	0	74	66	1.50
	1976*	3	105.1	97.3	0	0	79	71	1.86
Delaware County									
Dundee	1977*	9	39.7	38.5	0	0	29	25	2.01

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	Number of Samples	Maximum 2-Hour	2nd Maximum 2-Hour	Arithmetic Mean
Blackhawk County					
Waterloo Water Plant	1973*	730	1.00	0.74	0.14
	1974	3249	1.18	1.09	0.11
	1975	3360	0.87	0.74	0.11
	1976*	1478	1.04	0.65	0.09
	1977*	1219	0.48	0.44	0.07
Linn County					
Cedar Rapids City Garages	1973	2748	2.17	2.06	0.24
	1974	4003	3.79	2.22	0.22
	1975	4099	4.12	4.04	0.28
	1976	3883	4.95	3.12	0.29
	1977*	1930	4.81	4.52	0.41

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24 Hour	2nd Maximum 24 Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Blackhawk County						
Waterloo Water Plant	1973*	40	79.3	38.2	0	4.9
	1974	59	93.8	92.5	0	15.3
	1975	59	31.0	27.1	0	5.5
	1976*	39	12.5	12.5	0	5.1
	1977	54	188.0	29.5	0	11.0

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 3-Hour	Second Maximum 3-Hour	Number of Samples Exceeding 3-Hour Standard	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arith Mean
Blackhawk County									
Waterloo St. Mary's Convent	1976*	4409	301	289	0	57	41	0	3
	1977	8676	201	177	0	62	51	0	4
Linn County									
Cedar Rapids City Garages	1974	8318	572	469	0	232	214	0	54
	1975	8431	657	603	0	230	222	0	46
	1976	8511	647	631	0	390	332	1	59
	1977	7304	565	495	0	322	304	0	56
Cedar Rapids Linn County. Health Dept.	1973*	3877	-	-	0	288	259	0	42
	1975*	7207	467	357	0	183	173	0	42
	1976	8005	478	469	0	236	233	0	41
	1977	8243	558	442	0	260	228	0	37

TOTAL HYDROCARBONS - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 3 Hour (6-9 a.m.)	2nd Maximum 3 Hour (6-9 a.m.)	Number of Samples Exceeding 3-Hour Standard	Arithmetic Mean
Linn County						
Cedar Rapids Linn County. Health Dept.	1975*	4260	980	880	86	164
	1976	8365	740	713	120	118
	1977	7940	727	713	53	62

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

NITROGEN DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Violation of Annual Standard	Arithmetic Mean
Linn County						
Cedar Rapids Noelridge Park	1974*	8	31.7	29.3	No	19.9
	1975*	15	49.0	33.8	No	22.7
	1976	53	63.9	53.3	No	26.9
	1977	59	125.5	114.4	No	42.4

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Parts Per Million)

Site Location	Year	Number of Samples	Max. 1-Hour	2nd Max 1-Hour	No. of Samples Exceeding Standard	Max. 8-Hour	2nd Max 8-Hour	No of Samples Exceeding Standard	Arith Mean
Linn County									
Cedar Rapids Linn County Health Dept.	1973*	2252	10.0	10.0	0	9.1	6.7	1	2.30
	1974*	1555	20.0	16.0	0	9.0	8.6	0	2.23
	1975	7260	18.0	17.0	0	10.7	9.6	14	3.56
	1976	8101	20.9	17.5	0	10.8	9.6	3	2.25
	1977	8416	12.0	11.1	0	5.5	5.1	0	1.07

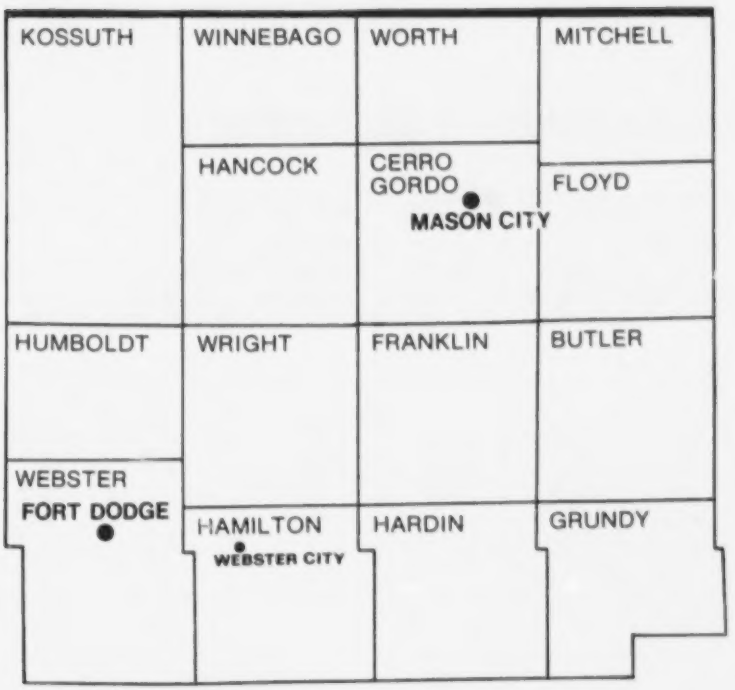
OZONE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 1-Hour	2nd Maximum 1-Hour	Number of Samples Exceeding 1-Hour Standard	Arithmetic Mean
Linn County						
Cedar Rapids Linn County Health Dept.	1975*	6297	160	160	0	40
	1976	8450	270	210	77	50
	1977	8480	278	262	254	64

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 089

NORTHCENTRAL IOWA INTRASTATE



The air quality in the Northcentral Intrastate Region improved in 1977 with reductions in suspended particulates at four of the six sites with monitoring equipment. All three monitoring sites in Mason City showed large decreases in suspended particulates averaging nearly twenty micrograms per cubic meter less than in 1976. Other pollutants monitored in Mason City such as coefficient of haze and sulfur dioxide also showed a decrease in 1977.

The annual suspended particulate level at the Highland Park School site in Fort Dodge decreased in 1977 while only a small increase in the annual level was reported at the Water Plant. Webster City is the only area showing a substantial increase, primarily due to poor monitor placement and operation. This monitor was discontinued in November, 1977.

In summary, the air quality in Northcentral Iowa appeared to have improved tremendously in 1977, but still remained above the national secondary standards for suspended particulate in Mason City and Fort Dodge.

AQCR 089 NORTH CENTRAL IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Cerro Gordo County				
Mason City Water Plant	339 - 13th St. NE	SHL	Hi-Vol Tape Sampler SO_2 - Bubbler	Industrial
Mason City Water Tower	14th & South Kentucky Ave.	SHL	Hi-Vol	Residential
Mason City Central Fire Station	Fifth & South Madison	SHL	Hi-Vol	Commercial
Hamilton County				
Webster City T. Loring Farm	Rural Route	SHL	Hi-Vol	Rural
Webster County				
Fort Dodge Municipal Water Plant	Phinney Park Dr.	SHL	Hi-Vol	Industrial
Fort Dodge Highland Park School	9th Ave. South & 25th Street	SHL	Hi-Vol	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Cerro Gordo County									
Mason City Water Plant	1970*	20	229.0	219.0	6	0	115	101	1.69
	1971	36	705.0	479.0	15	3	152	119	2.01
	1972	55	598.0	562.0	16	8	167	131	1.99
	1973	39	882.0	502.0	17	8	161	118	2.12
	1974	58	430.0	374.0	25	11	158	123	2.04
	1975	58	348.0	294.0	13	2	113	98	1.71
	1976	58	434.0	379.0	15	3	124	108	1.71
	1977	59	338.7	257.2	7	1	98	86	1.64
Mason City Water Tower	1973	43	231.0	218.0	4	0	88	76	1.72
	1974	62	257.0	210.0	6	0	86	74	1.77
	1975	57	292.0	254.0	3	1	71	62	1.64
	1976	60	284.0	246.0	3	1	83	72	1.77
	1977	58	104.0	100.4	0	0	54	51	1.48
Mason City Fire Station	1976	58	295.0	288.0	3	2	98	89	1.60
	1977	58	268.3	180.0	2	1	78	70	1.60
Hamilton County									
Webster City T. Loring Farm	1973	45	168.0	160.0	3	0	75	64	1.79
	1974	61	359.0	311.0	10	4	82	58	2.32
	1975	54	242.0	187.0	3	0	60	48	1.90
	1976*	42	234.0	193.0	5	0	83	67	2.08
	1977*	24	480.7	406.8	10	3	145	103	2.54
Webster County									
Fort Dodge Municipal Water Plant	1973	43	139.8	111.3	0	0	58	52	1.59
	1974	57	141.0	132.0	0	0	57	51	1.65
	1975	59	360.0	138.0	1	1	53	42	1.92
	1976	61	138.0	108.0	0	0	48	41	1.79
	1977	61	129.0	111.0	0	0	48	43	1.57
Fort Dodge Highland Park School	1976*	46	542.0	366.0	4	2	107	90	1.70
	1977	54	253.0	184.1	5	0	81	69	1.78

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	Number of Samples	Maximum 2-Hour	2nd Maximum 2-Hour	Arithmetic Mean
Cerro Gordo County					
Mason City Water Plant	1973*	1277	1.52	1.36	0.18
	1974	2461	1.18	0.65	0.09
	1975*	1664	1.40	1.40	0.10
	1976*	1998	0.48	0.44	0.08
	1977*	1489	0.57	0.36	0.04

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Cerro Gordo County						
Mason City Water Plant	1973*	40	109.0	83.8	0	6.8
	1974	59	362.0	272.0	0	25.7
	1975	51	622.0	291.0	1	30.5
	1976	59	157.0	86.2	0	14.6
	1977	57	89.3	71.9	0	11.8

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 090

NORTHWEST IOWA INTRASTATE

The Northwest Iowa Intrastate Region was the only intrastate region in Iowa that did not exceed the national standards for any monitored pollutants. The general air quality is very good and appears to have remained nearly the same as was recorded in 1976.

AQCR 090 NORTHWEST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Clay County				
Spencer Hospital	1st Ave. E. & 11th St.	SHL	Hi-Vol SO_2 - Bubbler	Residential
Emmet County				
Estherville Community College	Iowa Lakes Community College	SHL	Hi-Vol	Residential
Ida County				
Holstein City Center	510 Merkley	SHL	Hi-Vol	Residential

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Clay County									
Spencer Hospital	1973	43	251.0	161.0	2	0	80	68	1.78
	1974	59	220.0	166.0	4	0	71	60	1.83
	1975	61	311.0	210.0	4	1	70	58	1.87
	1976	59	321.0	159.0	2	1	66	55	1.87
	1977	59	198.0	179.9	3	0	65	55	1.76
Emmet County									
Estherville Community College	1976*	13	356.0	85.7	1	1	67	46	2.10
	1977	55	124.6	110.3	0	0	51	43	1.86
Ida County									
Holstein 510 Merkley	1975	34	115.0	109.0	0	0	45	39	1.74
	1976*	43	69.9	67.3	0	0	39	33	1.82
	1977*	32	91.2	84.3	0	0	38	35	1.52

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

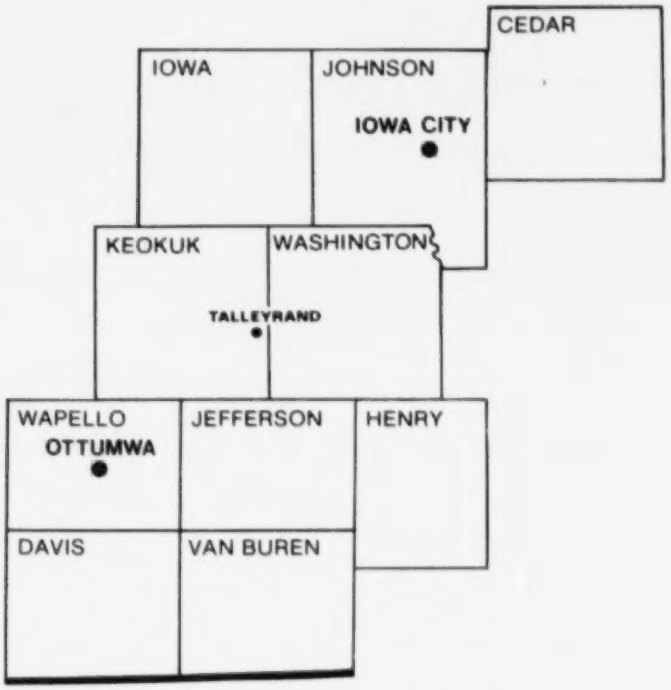
SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Clay County						
Spencer Hospital	1973*	22	0.0	0.0	0	0.0
	1974	60	25.7	12.5	0	4.8
	1975	58	12.5	12.5	0	5.8
	1976	59	12.5	12.5	0	6.4
	1977	61	34.9	12.5	0	8.8

* Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 091

SOUTHEAST IOWA INTRASTATE



The 1977 air monitoring values in the Southeast Iowa Intrastate Region showed only a minor change in air quality when compared to the 1976 figures. Suspended particulate levels decreased slightly in Iowa City and Ottumwa, while the rural site, Talleyrand, showed a slight increase. Suspended particulate values remained above the national primary standard in Iowa City during 1977. Sulfur dioxide levels increased slightly in 1977, but remained quite low with no violations of the national standards recorded.

AQCR 091 SOUTHEAST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Johnson County				
Iowa City Medical Lab. Bldg.	University of Iowa	SHL	Hi-Vol SO_2 Bubbler	Commercial
Keokuk County				
Talleyrand Cochran Farm	Rural Route	SHL	Hi-Vol	Rural
Wapello County				
Ottumwa City Hall	Fourth & Market Sts.	SHL	Hi-Vol SO_2 Bubbler	Commercial
Ottumwa Douma School	Schuyler & Mary Sts.	SHL	Hi-Vol	Residential
Ottumwa Fire Station	Fourth & Wapello	SHL	Hi-Vol	Commercial

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Johnson County									
Iowa City Medical Lab. Building	1971*	9	154.0	84.0	1	0	63	54	1.81
	1972	54	388.0	323.0	4	2	97	87	1.53
	1973	46	480.0	194.0	5	1	96	81	1.76
	1974	60	151.0	130.0	1	0	65	57	1.70
	1975	58	140.0	134.0	0	0	72	66	1.51
	1976	61	352.0	316.0	3	2	98	86	1.64
	1977	60	286.1	207.2	3	1	88	80	1.50

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Keokuk County									
Talleyrand Cochran Farm	1973	46	296.9	198.2	2	1	56	46	1.96
	1974	59	193.0	193.0	8	0	82	68	1.90
	1975	56	214.0	175.0	2	0	56	47	1.82
	1976	61	266.0	178.0	2	1	66	56	1.82
	1977	59	277.8	240.5	3	1	72	59	1.88
Wapello County									
Ottumwa City Hall	1974*	44	313.0	210.0	3	1	91	79	1.73
	1975	59	188.0	160.0	4	0	87	78	1.60
	1976	59	333.0	167.0	3	1	92	84	1.56
	1977*	15	125.4	122.1	0	0	87	82	1.48
Ottumwa Douma School	1976*	38	235.0	140.0	1	0	71	65	1.51
	1977	61	171.7	124.4	1	0	56	51	1.55
Ottumwa Fire Station	1977*	44	222.7	138.7	1	0	77	72	1.47

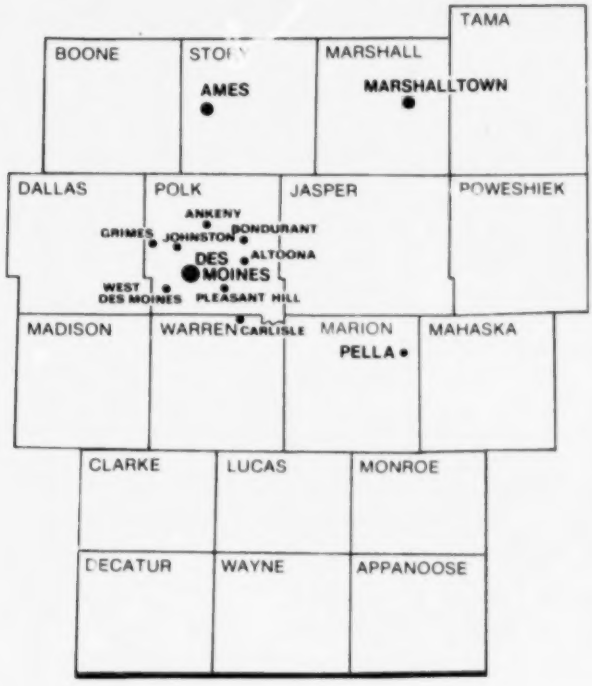
SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Johnson County						
Iowa City Medical Lab. Building	1973*	42	134.6	94.2	0	9.5
	1974	58	212.0	123.0	0	13.7
	1975	57	53.0	47.4	0	11.4
	1976	59	73.1	67.2	0	12.3
	1977	61	257.0	109.0	0	18.4
Wappelo County						
Ottumwa City Hall	1974*	17	20.6	12.5	0	5.6
	1975	53	12.5	12.5	0	4.5
	1976	60	12.5	12.5	0	5.4
	1977	60	23.3	12.5	0	9.6

*Do not use as annual statistics representative of air quality for that year because four valid quarters not available.

AQCR 092

SOUTHCENTRAL IOWA INTRASTATE



The air quality in the Southcentral Intrastate Region showed reductions in suspended particulates levels during 1977, but ozone and nitrogen dixide levels increased. Eleven of the fourteen suspended particulate sampling stations that had valid annual means for the past two years showed decreases in annual levels up to twenty micrograms per cubic meter. The number of 24-hour violations at these stations also decreased during 1977. The remaining three sites recorded only a slight increase in annual levels.

Sulfur dioxide and carbon monoxide levels were basically constant for the past two years. The Ames sulfur dioxide monitor reported two 24-hour violations, however, and showed an increase in annual levels. No other sulfur dioxide locations recorded any standard violations. Carbon monoxide levels in Des Moines decreased at the Des Moines Building location. However, eighteen violations of the national eight-hour standard were recorded at the two Des Moines monitoring sites during 1977.

Both ozone and nitrogen dioxide levels increased during 1977 in this region. While the number of one-hour violations of the ozone standard decreased at the Bondurant site in 1977, the total number of one-hour violations for the metropolitan area increased. The annual averages were also greater at both sites, making 1977 the third straight year of increasing ozone levels in this region.

Higher annual nitrogen dioxide levels were recorded in Polk county during 1977. Although no annual violations of the standards occurred, all monitoring sites recorded higher levels than in 1976.

AQCR 092 SOUTHCENTRAL IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Marion County				
Pella Pella Christian School	216 Liberty St.	SHL	Hi-Vol SO_2 Bubbler	Residential
Marshall County				
Marshalltown Marshalltown Mfg.	710 South 12th St.	SHL	Hi-Vol	Industrial
Marshalltown City Hall	State & Center Sts.	SHL	Hi-Vol Tape Sampler	Commercial
Polk County				
Altoona Water Works Bldg.	105 3rd St.	DMPC	Hi-Vol Sulfate	Commercial
Ankeny Water Works Garage	408 3rd St.	DMPC	Hi-Vol	Commercial
Des Moines Fire Station #1	Ninth & Mulberry	DMPC EPA	Hi-Vol Hi-Vol SO_2 Bubbler NO_2 Bubbler	Commercial
Des Moines Fire Station #17	2217 Beaver	DMPC	Hi-Vol	Residential
Des Moines Fire Station #8	1249 McKinley	DMPC	Hi-Vol	Residential
Des Moines Des Moines Building	6th & Locust	DMPC	CO Continuous	Commercial
Des Moines Iowa Police Radio Station	5912 Second Ave.	DMPC	Ozone	Residential
Des Moines Industrial Park	5299 N.E. 15th	DMPC	Hi-Vol	Commercial
Des Moines Blood Bank Garage	Eighth & Interstate 235	DMPC	SO_2 Bubbler NO_2 Bubbler	Commercial
Des Moines YMCA	Eighth & Grand	DMPC	CO Continuous	Commercial

Site Location	Address	Agency	Equipment	Environment
Polk County				
Des Moines National By-Products	S.E. 18th & Scott	DMPC	Hi-Vol SO_2 Bubbler NO_2 Bubbler	Industrial
Des Moines Trailer	Fairgrounds	SHL	SO_2 Continuous	Residential
Des Moines Trailer	E. 18th & Dean	SHL	SO_2 Continuous	Commercial
Des Moines State Hygienic Lab.	E. 7th & Court	SHL	Hi-Vol Tape Sampler SO_2 Bubbler	Commercial
Des Moines Fire Station #5	42nd Street & Interstate 235	DMPC	SO_2 Bubbler NO_2 Bubbler	Residential
Carlisle Water Lift Station	S.E. Avon Drive	SHL DMPC	SO_2 Continuous SO_2 Bubbler NO_2 Bubbler	Rural
Grimes Fire Station	404 S. 2nd St.	DMPC	Hi-Vol	Commercial
Pleasant Hill Sewage Treatment Plant	5440 Vandalia Rd.	DMPC	Hi-Vol SO_2 Bubbler NO_2 Bubbler	Rural
Johnston City Hall	5765 Merle Hay Road	DMPC	Hi-Vol	Commercial
Bondurant Farrar School	300 Garfield, S.W.	DMPC	Ozone	Residential
West Des Moines Crestview Acres	916 Ashworth	DMPC	Hi-Vol	Residential
West Des Moines Water Works Plant	1505 Railroad	DMPC	Hi-Vol	Commercial
Story County				
Ames Meeker School	20th & Burnett	SHL	Hi-Vol SO_2 Bubbler	Residential
Ames Greenhouse	505 S. Maple	SHL	SO_2 Continuous	Residential

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Marion County									
Pella									
Pella Christian School	1976	55	121.0	109.0	0	0	62	55	1.73
	1977	52	92.5	77.7	0	0	46	43	1.42
Marshall County									
Marshalltown									
City Hall	1976*	16	137.0	118.0	0	0	67	57	2.03
	1977	50	204.2	167.3	2	0	73	65	1.64
Marshalltown									
Marshalltown Mfg.	1976*	13	304.0	153.0	2	1	107	94	1.65
	1977	61	132.0	130.1	0	0	63	58	1.51
Polk County									
Altoona									
Water Works	1973	60	311.0	260.4	9	2	95	79	1.80
	1974	61	212.6	167.2	3	0	79	72	1.58
	1975	60	235.0	169.1	3	0	79	70	1.66
	1976	61	288.9	250.9	3	1	82	71	1.74
	1977	59	162.5	141.1	1	0	71	65	1.57
Ankeny									
Water Works Garage	1973	58	168.9	159.8	3	0	83	74	1.62
	1974	61	179.9	176.8	8	0	86	78	1.61
	1975	57	245.8	226.3	6	0	91	79	1.73
	1976	59	297.0	262.8	3	2	90	81	1.61
	1977	61	243.4	220.7	8	0	89	78	1.64
Des Moines									
Fire Station #1 (DMPC)	1969*	19	257.9	247.0	8	0	147	138	1.50
	1970	25	279.9	268.0	13	2	153	140	1.60
	1971	26	266.2	248.9	12	1	136	124	1.56
	1972	57	299.6	227.3	12	1	102	89	1.73
	1973	58	479.7	424.1	13	3	121	102	1.78
	1974	61	540.2	231.7	11	1	108	99	1.63
	1975	60	242.5	216.2	10	2	108	96	1.64
	1976	60	446.9	310.5	10	2	112	98	1.69
	1977	58	226.2	210.4	8	0	102	92	1.56

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Polk County									
Des Moines Fire Station #1 (EPA)	1957	26	458.0	401.0	17	2	176	160	1.53
	1958	26	360.0	296.0	11	2	165	152	1.50
	1959	25	462.0	246.0	17	1	174	159	1.55
	1960	25	329.0	326.0	16	7	183	164	1.63
	1961	24	392.0	301.0	3	2	130	119	1.50
	1962	26	291.0	261.0	7	2	128	116	1.58
	1963	25	351.0	279.0	8	2	127	110	1.71
	1964	25	299.0	213.0	6	1	128	117	1.55
	1965	25	313.0	291.0	8	3	142	127	1.60
	1966	25	242.0	192.0	5	0	123	114	1.51
	1967	25	258.0	223.0	4	0	117	108	1.47
	1968*	16	240.0	238.0	3	0	100	90	1.60
	1969	25	214.0	201.0	5	0	103	91	1.67
	1970	24	193.0	172.0	4	0	102	94	1.51
	1971	26	255.0	147.0	1	0	98	86	1.85
	1972	28	202.0	159.0	2	0	92	85	1.48
	1973*	3	108.0	56.0	0	0	67	61	1.55
	1974	29	367.0	166.0	2	1	89	75	1.76
	1975	36	181.0	159.0	2	0	71	63	1.64
	1976	48	226.0	160.0	2	0	77	70	1.53
Des Moines Fire Station #17	1969*	19	149.1	146.5	0	0	86	78	1.60
	1970	22	176.4	140.9	1	0	93	88	1.38
	1971	23	266.9	219.7	3	1	109	98	1.51
	1972	57	148.8	122.8	0	0	74	69	1.44
	1973	62	618.8	198.2	5	1	95	81	1.64
	1974	58	194.2	143.0	1	0	74	69	1.52
	1975	57	164.7	155.5	2	0	84	78	1.46
	1976	60	362.5	307.2	4	2	94	83	1.60
	1977	59	139.5	137.2	0	0	72	68	1.42
Des Moines Fire Station #8	1973	61	188.2	186.2	3	0	81	73	1.60
	1974	60	179.6	167.0	2	0	71	65	1.54
	1975	60	194.4	156.8	2	0	83	74	1.65
	1976	61	280.9	261.3	6	2	90	79	1.63
	1977	61	205.0	192.4	6	0	84	75	1.65

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Polk County									
Des Moines Industrial Park	1969*	4	152.5	123.1	1	0	111	106	1.41
	1970	26	291.0	208.9	5	1	105	90	1.72
	1971	35	227.9	220.9	10	0	113	95	1.74
	1972	57	301.6	290.3	10	2	97	82	2.02
	1973	58	265.7	258.0	12	1	98	82	1.81
	1974	60	838.5	666.7	18	6	140	106	2.03
	1975	59	728.3	615.5	19	10	163	115	2.20
	1976	61	652.9	410.3	22	6	155	129	1.85
	1977	42	694.3	636.3	16	7	171	134	1.92
Des Moines State Hygienic Lab	1971*	15	182.0	-	-	-	68	62	2.00
	1972	44	161.0	160.0	2	0	74	65	1.79
	1973	62	211.0	204.0	7	0	84	69	1.99
	1974	60	206.0	178.0	4	0	80	70	1.78
	1975	57	233.0	192.0	4	0	84	73	1.74
	1976	57	223.0	221.0	4	0	80	69	1.72
	1977	58	123.0	108.0	0	0	59	55	1.45
Des Moines National By-Products	1976*	5	147.8	109.1	0	0	110	108	1.19
	1977	56	287.9	249.5	12	1	123	110	1.61
Grimes Fire Station	1973	59	291.0	281.2	10	2	98	81	1.85
	1974	61	308.6	172.4	6	1	91	80	1.63
	1975	59	280.4	200.7	12	1	98	83	1.83
	1976	61	544.8	292.7	12	3	120	102	1.75
	1977	60	256.3	206.3	9	0	87	76	1.67
Pleasant Hill Sewage Treatment Plant	1973	61	191.8	189.7	2	0	70	61	1.70
	1974	58	180.3	163.2	2	0	60	55	1.55
	1975	60	146.6	139.1	0	0	58	51	1.68
	1976	60	236.2	179.0	2	0	62	49	2.14
	1977	59	322.1	152.3	2	1	62	52	1.81
Johnston City Hall	1976*	14	354.2	173.6	2	1	111	97	1.63
	1977	60	408.7	270.8	7	2	102	90	1.65

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SUSPENDED PARTICULATES - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Polk County									
West Des Moines Crestview Acres	1969*	19	231.0	155.7	3	0	105	90	1.88
	1970	24	217.9	170.0	4	0	102	89	1.84
	1971	23	243.4	207.5	4	0	99	90	1.74
	1972	56	196.2	194.4	2	0	70	58	1.67
	1973	61	292.5	240.1	4	1	78	68	1.65
	1974	59	296.1	201.0	4	1	79	70	1.64
	1975	60	156.8	149.1	1	0	71	63	1.69
	1976	61	315.2	214.8	5	1	82	67	1.93
	1977	58	150.5	127.3	1	0	70	65	1.50
West Des Moines Water Works Plant	1976	58	375.5	342.1	17	4	24	101	1.97
	1977	61	258.7	201.4	9	0	97	86	1.67
Story County									
Ames Meeker School	1976	59	294.0	183.0	2	1	67	57	1.72
	1977	58	163.8	112.9	1	0	52	47	1.56

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

COEFFICIENT OF HAZE - 2 HOUR CONTINUOUS SAMPLES
(COHS/1000 Linear Feet)

Site Location	Year	Number of Samples	Maximum 2-Hour	2nd Maximum 2-Hour	Arithmetic Mean
Marshall County					
Marshalltown Water Plant	1973	2293	0.65	0.57	0.08
	1974	3579	0.82	0.82	0.09
	1975	3430	1.13	1.00	0.10
	1976	2190	1.00	0.74	0.08
Marshalltown City Hall	1976	91	0.40	0.32	0.09
	1977	909	0.69	0.57	0.05
Polk County					
Des Moines State Hygienic Lab	1973	3304	1.00	0.87	0.11
	1974	3545	1.36	1.00	0.17
	1975	2876	1.00	0.95	0.13
	1976	2381	1.09	0.95	0.11
	1977	2625	2.04	0.69	0.08

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Marion County						
Pella Pella Christian School	1976	56	118.0	102.0	0	11.9
	1977	57	297.0	241.0	0	19.7
Polk County						
Des Moines Fire Station #1 (EPA)	1961*	15	236.0	-	0	27.0
	1962	26	367.0	-	1	52.0
	1963	24	79.0	-	0	21.0
	1964	24	39.0	-	0	12.0

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SULFUR DIOXIDE - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Polk County						
Des Moines Fire Station #1 (EPA)	1965	24	67.0	-	0	11.0
	1966	23	36.0	-	0	13.0
	1967	26	69.0	-	0	15.0
	1968	25	33.0	-	0	11.0
	1969	24	95.0	-	0	17.0
	1970	26	59.0	-	0	11.0
	1971	24	16.0	-	0	5.0
	1972*	15	28.0	-	0	7.0
	1973*	4	6.0	3.0	0	2.8
	1974	28	33.0	12.0	0	5.5
	1975	31	51.0	49.0	0	12.5
	1976	46	22.0	21.0	0	6.2
	1977*	17	31.0	24.0	0	8.9
Des Moines State Hygienic Lab	1973*	35	57.8	42.7	0	3.4
	1974	61	54.0	21.8	0	6.5
	1975	60	33.4	20.8	0	7.9
	1976	60	116.0	33.4	0	10.8
	1977	58	12.5	12.5	0	8.4
Des Moines Community Blood Bank	1976*	15	19.5	13.0	0	2.8
	1977	61	76.5	25.9	0	3.5
Des Moines National By Products	1976*	5	10.3	9.0	0	6.2
	1977	61	19.7	11.8	0	2.5
Des Moines 42nd & I-235	1976*	18	10.5	7.9	0	1.6
	1977	61	22.4	19.7	0	2.1
Carlisle Water Lift Station	1976	57	81.6	31.5	0	5.6
	1977	61	19.7	18.7	0	2.1

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

SULFUR DIOXIDE - 24 HOUR SAMPLES (CONTINUED)
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Polk County						
Pleasant Hill Sewage Treatment Plant	1973*	21	112.3	101.9	0	37.1
	1974	46	34.4	30.1	0	11.2
	1975	59	132.5	31.2	0	5.9
	1976	60	153.3	48.2	0	8.8
	1977	61	39.4	29.3	0	4.1
Story County						
Ames Meeker School	1976	60	67.2	48.1	0	4.8
	1977	59	37.1	33.8	0	9.6

SULFUR DIOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 3-Hour	Second Maximum 3-Hour	Number of Samples Exceeding 3-Hour Standard	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arith. Mean
Polk County									
Des Moines E. 18th & Dean	1975*	3928	145	132	0	71	38	0	2
	1976	8163	161	160	0	97	72	0	4
	1977	6662	524	176	0	114	60	0	1
Carlisle Water Lift Station	1975*	3619	197	167	0	119	103	0	3
	1976	8671	177	163	0	124	97	0	2
	1977	8395	111	70	0	36	26	0	1
Story County									
Ames Greenhouse	1975*	491	290	264	0	140	20	0	8
	1976	7646	645	605	0	427	340	1	2
	1977	7432	701	695	0	682	593	2	18

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

CARBON MONOXIDE - 1 HOUR CONTINUOUS SAMPLES
(Parts Per Million)

Site Location	Year	Number of Samples	Max. 1-Hour	2nd Max 1-Hour	No. of Samples Exceeding Standard	Max. 8-Hour	2nd Max 8-Hour	No of Samples Exceeding Standard	Arith Mean
Polk County									
Des Moines									
Des Moines Bldg.	1976	7727	26.5	21.5	0	17.3	11.9	9	2.47
	1977	8447	18.5	17.5	0	10.6	10.3	5	2.24
Des Moines YWCA	1976*	743	22.5	22.0	0	10.9	10.5	5	3.01
	1977	8527	26.0	23.5	0	10.9	10.8	13	2.73

OZONE - 1 HOUR CONTINUOUS SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 1-Hour	2nd Maximum 1-Hour	Number of Samples Exceeding 1-Hour Standard	Arithmetic Mean
Polk County						
Des Moines						
Iowa Police Radio Station	1971*	4017	210	200	16	-
	1972*	3120	160	160	0	-
	1973*	627	110	110	0	29
	1974	7065	160	160	0	37
	1975	7913	198	194	26	48
	1976	7395	204	202	156	63
	1977	7861	240	224	282	66
Bondurant						
Farrar School	1974*	2324	64	64	0	18
	1975	8491	200	200	127	56
	1976	8521	230	228	248	65
	1977	8601	232	224	172	62

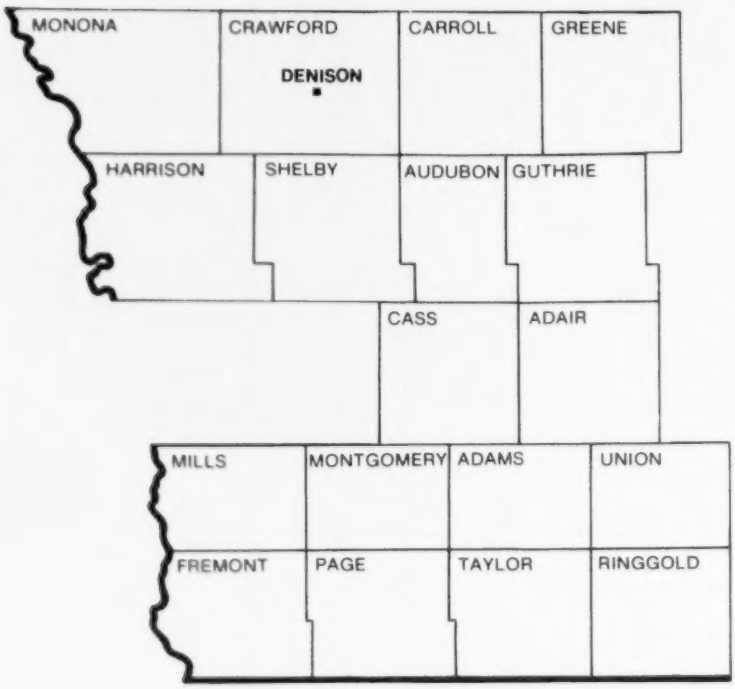
*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

NITROGEN DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Violation of Annual Standard	Arithmetic Mean
Polk County						
Des Moines Fire Station #1 (EPA)	1967*	12	66.0	-	No	26.0
	1968	23	34.0	-	No	17.0
	1969	23	26.0	-	No	12.0
	1970*	7	13.0	-	No	10.0
	1973*	4	133.0	65.0	No	66.5
	1974	27	106.0	73.0	No	43.6
	1975	34	70.0	62.0	No	40.1
	1976	52	80.0	79.0	No	48.9
	1977*	18	210.0	78.0	No	52.9
Des Moines Community Blood Bank	1976*	15	68.7	28.3	No	15.1
	1977	61	99.5	93.0	No	50.6
Des Moines National By Products	1976*	5	49.8	49.8	No	38.3
	1977	60	81.7	64.7	No	33.6
Des Moines 42nd & I-235	1976*	18	52.4	48.2	No	39.1
	1977	61	92.1	85.9	No	44.2
Carlisle Water Lift Station	1976	59	46.0	26.0	No	11.8
	1977	60	48.0	33.7	No	12.9
Pleasant Hill Sewage Treatment Plant	1973	33	248.3	139.0	No	58.7
	1974	56	139.0	129.1	No	23.6
	1975	58	38.8	36.8	No	14.0
	1976	59	33.0	30.6	No	16.3
	1977	60	61.9	51.6	No	21.6

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

AQCR 093
SOUTHWEST IOWA INTRASTATE



Denison is the only city currently having monitoring equipment in the Southwest Iowa Intrastate Region. Suspended particulate levels decreased in 1977 when compared with the 1976 monitoring values. Both the annual and 24-hour values showed decreases in 1977 with the annual geometric mean attaining the annual secondary standard. Sulfur dioxide levels were again quite low with only a slight increase in the annual average. In general, the air quality appears to be very good for this air quality control region using the data for Denison as a representative location.

AQCR 093 SOUTHWEST IOWA INTRASTATE REGION

Site Location	Address	Agency	Equipment	Environment
Crawford County				
Denison Municipal Water Plant	U.S. 59 & Ia. 141	SHL	Hi-Vol SO_2 Bubbler	Rural

SUSPENDED PARTICULATES - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	Second Maximum 24-Hour	Number of Samples Exceeding 24-hour Standard		Arithmetic Mean	Geometric Mean	Standard Geometric Deviation
					Secondary	Primary			
Crawford County									
Denison Municipal Water Plant	1972*	6	48.0	44.0	0	0	35	34	1.29
	1973	43	198.0	193.0	2	0	82	73	1.66
	1974	58	311.0	284.0	5	2	75	58	2.10
	1975	56	153.0	148.0	1	0	66	56	1.80
	1976	58	325.0	191.0	5	1	82	68	1.90
	1977	60	226.8	165.5	2	0	66	58	1.63

SULFUR DIOXIDE - 24 HOUR SAMPLES
(Micrograms Per Cubic Meter)

Site Location	Year	Number of Samples	Maximum 24-Hour	2nd Maximum 24-Hour	Number of Samples Exceeding 24-Hour Standard	Arithmetic Mean
Crawford County						
Denison Municipal Water Plant	1973*	38	0.0	0.0	0	0.0
	1974	55	15.4	12.8	0	3.5
	1975	55	12.5	12.5	0	4.4
	1976	59	12.5	12.5	0	3.8
	1977	58	12.5	12.5	0	7.5

*Do not use as annual statistics representative of air quality for that year because four valid quarters are not available.

VI. SUMMARY OF STATEWIDE DATA ANALYSIS AND TRENDS

Suspended Particulates

Suspended particulate concentrations showed the most significant decrease of any pollutant monitored in Iowa in 1977. A downward trend from 1976 in the annual geometric means occurred at twenty-eight of the thirty-five sites having valid geometric means in 1976 and 1977. Twenty-one of these twenty-eight decreased by an amount greater than five micrograms per cubic meter.

Table 2 shows the trends for individual sites in consecutive years between 1973 and 1977. Except for the 1975-1976 comparison years a downward trend in suspended particulate concentrations have occurred during all comparison periods. This downward trend is also reflected in the statewide average suspended particulate levels.

The annual average for all valid sampling sites decreased in 1977 to the lowest average since extensive suspended particulate monitoring began in 1973. The statewide average was 71.8 micrograms per cubic meter (ug/m^3) as compared to an annual average of 80.3 ug/m^3 in 1976; 72.7 ug/m^3 in 1975; 75.2 ug/m^3 in 1974, and 80.0 ug/m^3 in 1973.

The downward trend in 1977 is believed to primarily be the result of an extensive amount of precipitation in the last five months of 1977 that ended a two year dry period. Statewide precipitation levels were above normal in August and September with many locations recording nearly half of their yearly rainfall in August. The surplus of moisture helped reduce fugitive dust in most areas creating lower concentrations throughout the state.

Table 2
Yearly Trends of Geometric Means
from Hi-Volume Data

Comparison Years	1973-1974	Total	1974-1975	Total	1975-1976	Total	1976-1977	Total
Decrease (ug/m^3)								
>15	7		5		2		7	
11-15	3	21	6	31	0	11	8	28
6-10	7		7		5		6	
0-5	4		13		4		7	
No change								
0	1	1	0	0	0	0	1	1
Increase (ug/m^3)								
0-5	3		9		7		5	
6-10	2	13	5	19	14	35	0	7
11-15	2		1		7		1	
>15	6		4		7		1	
Total Number of Monitors		35		50		46*		36*

*This number represents a reduction in the number of valid annual averages, not the total number of monitoring sites, due to a more stringent criteria used to determine valid annual data which was implemented in 1976.

A continued decrease in industrial particulate emissions may also have contributed to a portion of this reduction in particulate levels. Industrial sources across the state have continued to make additional progress in controlling their suspended particulate emissions.

Sulfur Dioxide

Two monitoring sites in Iowa exceeded the twenty-four-hour standard for sulfur dioxide in 1977. The Ames monitor recorded two days of violations in March while the Dubuque monitor recorded five violations in three different months. The exact cause of these high levels have not been determined, however an extensive investigation of the high levels is being conducted. Annual means at all locations continued to be quite low.

For gas bubblers, no twenty-four hour violations were recorded during 1977. Annual means remained relatively constant with eleven monitors showing increases, six showing decreases and one having no change. In all cases the increases and decreases were less than ten migrograms per cubic meter and none of the values approached the annual standard. No positive trends in statewide sulfur dioxide levels can be determined from the 1977 data.

Carbon Monoxide

Three of the five carbon monoxide monitors operating in the state recorded violations of the eight-hour carbon monoxide standard. There were, however, no violations of the one-hour standard. Two monitors operated in Des Moines in 1977; the Des Moines Building (6th and Locust) site exceeded the eight-hour standard five times, while the YWCA Building site (8th and Grand) exceeded the standard thirteen times. Davenport recorded two violations in 1977. Both Cedar Rapids and Dubuque recorded no eight-hour standard violations during the past year.

Two sites, Des Moines' 6th and Locust and Cedar Rapids' 751 Center Point Road, showed decreases in the number of violations recorded in 1977 when compared to 1976. Although the amount of data is not statistically significant, it appears that carbon monoxide violations reversed its previous upward trend the past few years and decreased in 1976 and 1977. The annual mean also showed a decrease in Cedar Rapids, and remained relatively constant in Des Moines and Davenport, however, a slight increase was seen in Dubuque.

Photochemical Oxidants

Ozone violations increased dramatically for all monitoring sites in Iowa for the second straight year. The highest one-hour value ever recorded in Iowa, 278 micrograms per cubic meter (.139 ppm), occurred in June in Cedar Rapids. The Cedar Rapids monitor recorded 154 violations of the one-hour standard in 1977 compared to 77 recorded in 1976. The Des Moines Iowa Police Radio Station monitor recorded 282 violations in 1977, over two times as many as recorded in 1976. Three sites showed decreases in 1977, but still exceeded the one-hour standard. The Bondurant site recorded 172 violations and the Quad Cities area had twenty-nine violations, with thirteen at the Iowa Highway Patrol Station, sixteen at the Eldridge monitor and no violations at the St. Ambrose site. As seen by the increase in violations, there is definitely a trend toward higher ozone levels and more numerous standard violations throughout Iowa.

Nitrogen Dioxide

There were no violations of the annual standard for nitrogen dioxide in 1977. Four gas bubblers had valid data for the year, all of which showed an increase in the annual arithmetic mean. This is the second consecutive year that the annual averages have increased.

Hydrocarbons

Only one city in Iowa, Cedar Rapids, monitored hydrocarbons in 1977. The three-hour hydrocarbon guideline was exceeded fifty-three times in 1977 at this site, down from one hundred and twenty exceedances recorded in 1976.

VII. Air Quality Classifications

Section 107 of the New Clean Air Act Amendments of 1977 requires each state to identify those areas that do not meet the national primary and secondary ambient air quality standards for all pollutants and to identify those areas where data is insufficient for classification. The areas that exceed the standards are called non-attainment while areas that are below the standards are called attainment. Those areas that are not designated non-attainment or attainment are called unclassified.

The prime source of information in designating non-attainment, unclassified and attainment areas came from air monitoring being conducted by the State and local programs. However, since air monitoring is not conducted in all parts of a city, county or air quality control region some interpretation of the monitoring data is necessary. For example, the suspended particulate monitor in Denison is recording levels below the primary and secondary ambient air quality standard. We interpret this data as being representative of all rural cities in Western Iowa with a small industrial base. Using this process, a large majority of the cities and counties can be considered attainment areas for suspended particulates.

In the areas of the state that the monitoring levels are above the primary or secondary standards an air quality computer model is used to estimate the dimensions of the areas that will be above the primary or secondary standards. The model is calibrated with actual air sampling data and the projected areas exceeding the primary and secondary standards are designated non-attainment. If, 1) the monitoring data and the modeling projections does not correlate or

2) there is no monitoring data to compare with the modeling results but the diffusion model indicates non-attainment, the area is designated unclassified. In most cases the unclassified areas border non-attainment areas. The above process is used for suspended particulates, sulfur dioxide and carbon monoxide.

Another pollutant, ozone, is very complex in its effects and is not thoroughly understood. Iowa currently monitors ozone in three counties: Linn, Polk and Scott. Since the monitoring data show violations of the air quality standards for photochemical oxidants, these counties were designated non-attainment. The Environmental Protection Agency included Pottawattamie County as a non-attainment area for ozone even though monitoring data are not available in that county. (DEQ originally recommended to the EPA that Pottawattamie County should be designated unclassified for ozone). There are numerous sources that have documented the transport of ozone by the wind. Because ozone can be transported in high concentrations beyond the county limits, adjacent counties downwind of the non-attainment area are designated unclassified.

Nitrogen dioxide is not extensively monitored in the State because of the lack of large sources. Three areas, however have relatively large nitrogen dioxide emission sources but no monitoring data. These three areas are designated unclassified until further information can be made available.

Table 3 lists the areas of the state that are designated non-attainment and unclassified.

In addition to the designation process mentioned above, the new Clean Air Act Amendments require the states to take certain steps to bring non-attainment areas into compliance with air quality standards. This plan must be submitted by January 1, 1979, and include administrative rules for controlling existing sources of pollution as well as future sources of emissions. DEQ will be working closely with local government officials in all aspects of Iowa's clean air planning to develop the most feasible and economical approach to assuring attainment of the national air quality standards.

TABLE 4

NON-ATTAINMENT AND UNCLASSIFIED
AREA DESIGNATIONS FOR IOWA

Suspended Particulate

	Non-Attainment	Unclassified
Black Hawk	City of Waterloo	Cedar Falls Township East Waterloo Township
Cerro Gordo County	Lime Creek Township Mason Township	Falls Township Lake Township Lincoln Township
Clinton County	Clinton Township	Camanche Township
Des Moines County	None	Burlington Township
Johnson County	None	Iowa City Township
Lee County	Keokuk Township	Jackson Township Jefferson Township Madison Township
Linn County	Rapids Township	Bertram Township Clinton Township College Township Fairfax Township Marion Township Monroe Township Putnam Township
Marshall County	City of Marshalltown	None
Muscatine County	Muscatine Township	Sweetland Township Montpelier Township Fruitland Township
Polk County	Bloomfield Township Crocker Township Delaware Township Des Moines Township Lee Township Saylor Township Walnut Township Webster Township	Clay Township Douglas Township Jefferson Township
Pottawattamie County	Kane Township	Lake Township Lewis Township
Scott County	Buffalo Township City of Davenport Pleasant Valley Township	None

Table 4 (continued)
Suspended Particulate (continued)

	Non-Attainment	Unclassified
Story County	None	City of Ames
Wapello County	None	Center Township
Webster County	Cooper Township Pleasant Valley Township Wahkonsa Township (Fort Dodge)	Otho Township
Woodbury County	City of Sioux City	Liberty Township Woodbury Township
	Sulfur Dioxide	
Dubuque County	Julien Township	Dubuque Township
	Ozone	
	Linn County Polk County Pottawattamie County Scott County	Boone County Buchanan County Clinton County Delaware County Harrison County Jasper County Jones County Marshall County Story County
	Carbon Monoxide	
Linn County	None	Rapids Township
Polk County	Des Moines Township Lee Township	None
Scott County	None	City of Davenport
	Nitrogen Dioxide	
Clinton County	None	Camanche Township Clinton Township
Lee County	None	Jefferson Township Madison Township
Woodbury County	None	Liberty Township

VIII. Summary of High TSP Concentrations from Winter Storms in Iowa

Suspended particulates are generated by both man-made and natural sources which, along with proper meteorological conditions, may create levels exceeding the national ambient air quality standards. Many suspended particulate standard violations cannot be attributed directly to either man-made sources (industry, transportation, agriculture) or natural sources (volcanoes, wind erosion).

The following summary documents two days of suspended particulate levels above the national standards that have been directly attributed to both a man-made source, agriculture, and a natural source, wind erosion.

December 9, 1977

On December 8, 1977, most of Iowa was receiving snow from a developing low pressure system centered in Oklahoma in the morning. The low pressure system passed southeast of Iowa during the evening shifting winds to the northwest. Reports from the Des Moines weather service station showed winds averaging 25-30 miles per hour (mph) for the evening of December 8 and much of December 9 with gusts reaching as high as thirty seven miles per hour. Other cities reported similar windy conditions as shown below:

Station	Average Wind Speed	Wind Direction (From North)	Highest Gust
Burlington	12.9 mph	310°	28 mph
Des Moines	20.6 mph	310°	37 mph
Moline	22.0 mph	290°	35 mph
Sioux City	18.8 mph	310°	32 mph
Waterloo	22.8 mph	310°	35 mph

Northcentral Iowa is the heart of farming in Iowa with much of this flat land used for crops. In the fall many farms are harvested and tilled, exposing the soil to erosion. Even though snow covered much of Iowa, soil erosion appeared to be the dominant source of suspended particulate from filter analysis and staff observations. The strong force of the winds during this storm stripped the snow from the fields and began eroding the soil and suspending these particles in the air.

A definite pattern in suspended particulate levels appeared as shown in Figure 3. The stars in this illustration represent monitoring sites with monitored suspended particulate levels adjacent. The dark lines represent isopleths of particulate values formed from interpretations of the data. A definite northwest to southeast pattern developed.

January 26, 1978

A similar occurence as discussed above was observed on January 26, 1978. A low pressure system again developed south of Iowa and moved northeast producing strong, northwesterly winds. Reports from the Des Moines weather service station showed winds averaging 25 mph with gusts reaching 36 mph. Other cities reported similar windy conditions as shown below:

Station	Average Wind Speed	Wind Direction (From North)	Highest Gust
Burlington	22.3 mph	300	32 mph
Des Moines	25.6 mph	310	36 mph
Moline	26.3 mph	300	34 mph
Sioux City	28.6 mph	310	37 mph
Waterloo	26.3 mph	300	32 mph

Soil erosion again appears to be the major source of particulate on the analyzed filters. The highest concentrations occurred in Central Iowa as illustrated in Figure 4. A definite northwest to southeast pattern similar to the December 9, 1977 pattern developed across the state, however the highest concentrations were farther west than on December 9.

Man-made sources of exposed land and natural occurrences of high winds appear to have produced this high level of suspended particulates. Both of these days' high values are a direct result of soil erosion, primarily from exposed farmland. Actual monitoring values vary because of different soil conditions and wind speeds. Prevention of future occurrences can be accomplished by decreasing the amount of land tilled in the fall to reduce the amount of exposed farmland and therefore reduce the amount of potential soil erosion.

FIGURE 3
SUSPENDED PARTICULATE LEVELS RECORDED ON
DECEMBER 9, 1977
(VALUES ARE IN MICROGRAMS PER CUBIC METER)

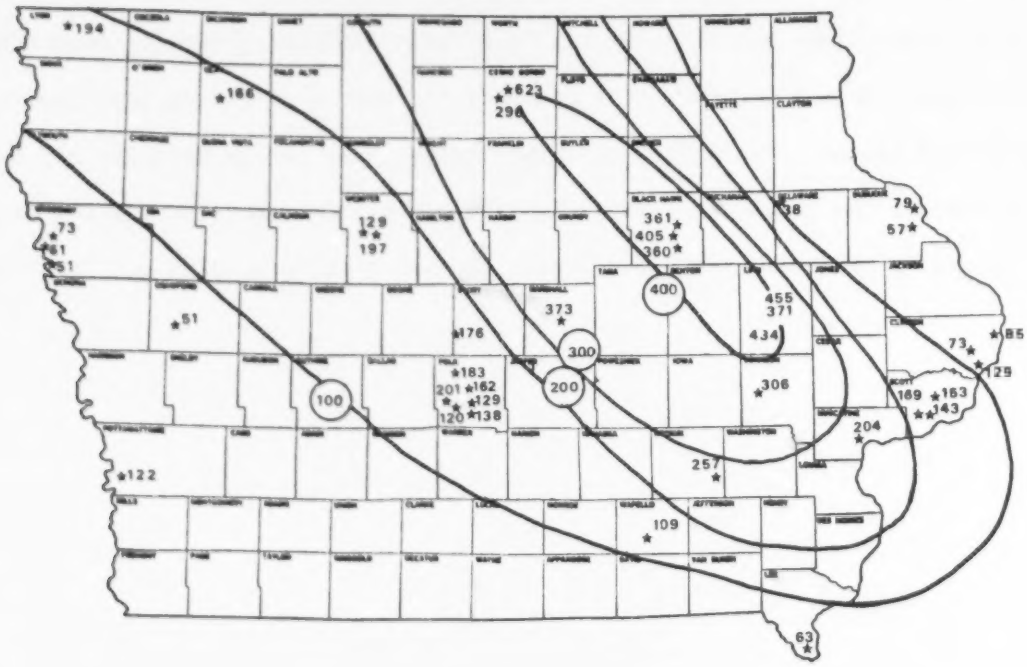
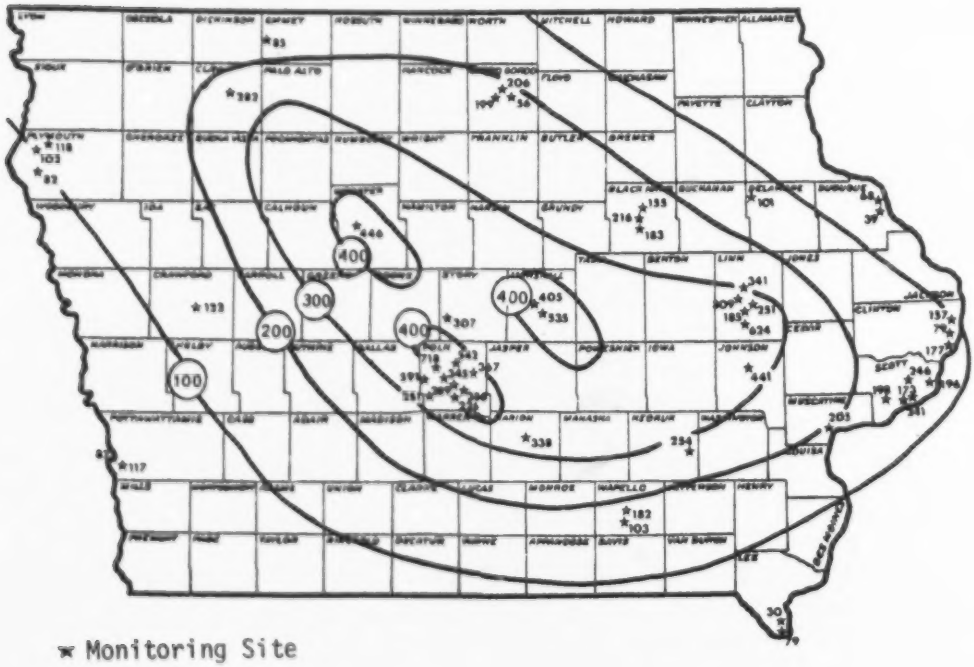


FIGURE 4
SUSPENDED PARTICULATE LEVELS RECORDED ON
JANUARY 26, 1978
(VALUES SHOWN ARE IN MICROGRAMS PER CUBIC METER)



★ Monitoring Site

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